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35MM PHOTOGRAPHY Summer 1977



Page 20



Page 34



Page 26

- 6 The Strip by Peggy Sealfon and Merrill Roseman**
New York City's 57th Street has become photography's Gallery Row. We interview 13 gallery directors, and many of the photographers they represent. The picture that emerges is fascinating!
- 20 The Fat Cats of Photography**
Minor Lenses in Theory & Practice
How to Use Them by *Leif Erickson*
How They Work by *Bob Schwalberg*
- 34 Dorchester Days Photo Essay by Eugene Richards**
Text by *Dorothea Lynch*
A revealing look at a New England town, and the photographer who tried to go home again.
- 42 Anybody Can Be a Critic by Harvey V. Fondiller**
Want the upper hand? Here's how, by one who has it.
- 44 What You See Is Not What You Get by Robert Martin**
Your SLR viewfinder may not be as precise as you think it is. Here's a surprising test you can make.
- 49 Flash by Ken Werner**
A special 16-page primer on small electronic light sources.
- 65 Planes Color portfolio by Ted D'Arms**
Subtle variations on a theme, with text by *Bill Pierce*.
- 70 Color Printer's Bible (IV) by Bob Nadler**
The concluding installment, analyzing the color analyzer.
- 76 Borderlines Portfolio by Danny Lyon**
A documentarian turns artist to expand our vision.
- 84 645: The Ideal Format? by Dan O'Neill**
A 35-mm photographer evaluates the new-breed medium-format contenders.
- 92 Footwork by Bill Saunders**
They're not fancy, but footswitches sure work in the dark. Our step-by-step directions will help you make this one.

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THE STRIP

A peripatetic tour along photography's new "White Way": 57th Street

BY PEGGY SEALFON and MERRILL ROSEMAN

An interesting phenomenon is occurring on New York City's 57th Street. In the short span of two years, photographic galleries, including the two biggest, have begun to migrate to this classy shopping thoroughfare, and many existing 57th Street art galleries have opened their wall space to this increasingly popular medium. Suddenly, 13 well-established galleries on 57th Street represent photography in some way, and the number continues to multiply.

Walking along what many in photography now call The Strip, one immediately perceives a sense of sophisticated snobbism. The 57th Street personality is a mixture of contrasts. Innovative architecture stands beside classical turn-of-the-century buildings. Staid bank facades confront lavish boutiques offering expensive clothing and chic accessories. Charming restaurants mix with overdecorated coffee shops. Arranged here and there are New York's famous hair salons. And within many of the buildings, elevators carry passengers to floor after floor of art galleries showing almost every conceivable art form.

As photographer Alan Dennis observed about 57th Street, "You can buy your clothes, get your hair cut, and look at art."

Certainly, 57th Street has become the uptown hub for art galleries. Veteran gallery director Sidney Janis mentions that five years ago, when Madison Avenue began to bloom, there was a trend away from 57th Street, but today dealers are leaving Madison Avenue to return to "the center." One reason is attributed to a lowering of rents. Soho—the downtown art area that is rapidly

becoming desirable—costs about \$3-4 per square foot while space on more-prestigious 57th Street rents for \$7-8 per square foot. Another reason for the attraction—especially for a new art gallery—is the already developed art traffic pattern. As gallery director Virginia Zabriskie notes, people like the idea that they can see 15 shows—satisfy all cultural requirements—in one hour.

Much as some artists might find the "snobbism" and talk of "prestige" offensive, there is no denying that showing on 57th Street connotes a specific level of art achievement. Philadelphian Bill Larson, a photographer represented by Light Gallery, is amused by the fact that "people in Philadelphia who could come to me directly to get work prefer to come up to New York and bring the work back. It's a whole mentality about buying and collecting and bidding."

Certainly other important photography galleries exist beyond the 57th Street limit, but our feeling is that much of the larger gallery scene is epitomized by this one street. To get a well-rounded picture of the 57th Street scene, we talked with the directors of all the galleries currently handling photography and we queried a number of photographers about the galleries that represent them. After talking with so many directors and photographers, however, we discovered a number of issues, questions, and miscellaneous topics that seemed to resist being neatly fitted into a specific profile of 57th Street. We treat these separately at the end of the article.

WITKIN GALLERY (41 East)

The Witkin Gallery was the first "professional uptown" gallery to enter

the realm of art photography. Since opening eight years ago, the gallery has always been run by the man who gives his name to it: Lee Witkin.

Originally, Witkin was a collector of etchings, paintings, and books. He had studied art history at New York University and claims that he "loved galleries," which he made his "hobby." In the late '60s, he worked as a writer/editor on an engineering trade magazine—a job he viewed as a dead end—and decided finally to quit and open a gallery. Recognizing that the photographic print was a "collectible" that no other gallery was showing or selling, Lee took his \$6,000 savings and invested it in photography. Witkin admits he knew little about the medium. "I'd never even heard of Berenice Abbott," he says. Fortunately, Lee met photographer George Tice at the time; Lee credits him with being "very fundamental in educating me and introducing me to people like Scott Hyde, George Krause, and Duane Michals."

The very first photography show at the Witkin Gallery included eight prints by five photographers: Scott Hyde, George Krause, Duane Michals, George Tice, and Burk Uzzle. The second, all-woman, show included works by Barbara Morgan, Naomi Savage, and Nancy Sirkis. The third exhibit, of Berenice Abbott's Atget prints, was a tremendous hit and affirmed photography in Lee's mind: it was the show that put the gallery in the black. Even greater success followed. After touring California and meeting Cole Weston, Witkin arranged an Edward Weston show (of Cole's prints) that sold an unprecedented 150 prints. From then on, says Lee,

"I am doing the same thing I've done from the very first day I opened, which is to stock my gallery with beautiful prints and try to sell them to people who care about them...and books, too." —Lee Witkin



©All photographs by Merrill Roseman, except above, by Peggy Sealton

photography just "started to snowball."

Duane Michals refers to the late '60s in photography as a time when "there was a vacuum and a need for a serious gallery." Norbert Kleber, Michals acknowledges, had a small photography gallery, but his was "a cottage industry." Witkin, who was "the right person at the right time with the right energy and the right taste," came onto the scene and "suddenly," exclaims Michals, "it became MGM. Lee became high-powered and threw all his energies into it. . . . He deserves the rewards he got from it. . . . Lee was a businessman who wasn't a photographer, but who made it work. He is an art dealer."

Witkin agrees that other galleries preceded his into photography, but mostly they were "either run by photographers who wanted to show their own work or they were run by people who, when they didn't feel like being open, weren't there." Witkin, on the other hand, treated photographs as art objects. Prints were hung carefully in frames with glass, and people began to handle and respond to them as art objects. Photographs, Lee says "weren't something tacked up on the wall. They were treated in a very professional way. I was putting into my gallery all the best features of galleries I had visited over the years as a collector."

The original Witkin Gallery was a \$200-a-month "one-man shop" on East 60th Street in a modest, second floor rear space. "It was very simple," says Lee, "and no one expected it to last more than six months. People on the street couldn't believe that I was selling something like photographs and expecting it to last." It did last. And it grew. In 1972, Witkin moved to another

second floor of another brownstone on East 60th Street and two years later expanded the space to include half of the floor above. Then, in February, 1976, Witkin says, "we moved to these 'palatial quarters.'"

Lee's own words suggest a loss of the intimacy and coziness, long associated with the gallery. However, young photographer Sherry Suris, who liked the old gallery and found it very warm and homey, thinks the new, more "glamorous" surroundings still "retain a very warm feeling. It's sort of like going into someone's living room. I love to go there. I love to go and just browse through. I think it is the nicest gallery that way."

The new location has a tiny front room/reception area with walls cluttered with photographs and a glass case of daguerreotypes and memorabilia. The main exhibition room offers on one side a plush, comfortable sitting arrangement for relaxing after a tour around the show, and on the other side has rows of "bins" in which the works by photographers represented at Witkin are arranged alphabetically for easy viewing. The back exhibition area also has a few bins in addition to print storage cabinets. The current show is usually on exhibit in rows along all the walls. (Naomi Savage questioned whether so many photographs should be hung so closely together.) Around a corner from the main room is a cozy library/reading room with a wonderful assortment of photography books, magazines, brochures, postcards, newspapers, etc.

Though the Witkin Gallery has obviously enlarged its quarters, Witkin asserts, "I am doing the same thing I've

done from the very first day I opened, which is to stock my gallery with beautiful prints and try to sell them to people who care about them . . . and books, too." The orientation of Witkin is "totally eclectic." The gallery will show "everything and anything that works; whether it's painting on photographs, distorted photographs, collage, multiple images, straight photography, 19th century photography, 20th century. Anything."

The gallery for Lee is "both a business and a love" and he works "very hard to create a place where people who love photography and books can come, enrich themselves, be comfortable. It's a haven for people who love art; this particular kind of art." However, he does seem distressed by the "tremendous pressures of success where you have to get bigger every year." Competition has pushed Lee out of a small gallery that he could handle himself with one assistant and a parttime person, and he sincerely misses the situation of being able to "talk to people, where the pressures weren't so great to meet the overhead, where I didn't have to be involved in projects which take me away from what I really like, which is handling the material and contact."

Though physically the gallery has gone through a metamorphosis, Witkin's philosophy has remained unchanged. Lee continues to offer photographers respect and loyalty and support. W. Eugene Smith gratefully acknowledges Lee's help. A number of years ago, Smith relates, "I was on a blacklist as far as getting assignments and things. Lee used to come down and buy pictures. Time after time it enabled me to keep going, to help me pay the rent." Gene

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says, "We may have differences on minor points, but I still have great loyalty for him for all the good things that he has done."

For George Tice, the relationship has been a "reciprocal kind of thing." To promote Tice's latest limited-edition portfolio, Witkin printed a "really deluxe brochure." In addition, Tice says, "he's gotten me commissions like the International Airport in Miami to do wall art." And Witkin even helped to subsidize Tice's retrospective monograph (1953-1973) published by Rutgers University Press.

A contract between Lee Witkin and his photographers is unheard of, it seems. As Smith says "no agreement, just mutual respect and mutual cooperation." Most have a gentlemen's agreement with Lee, though letters are written and signed. The percentage breakdown on sales is the standard 60-40: 40% commission on consignment work, with 60% going to the photographer. On outright purchase, the percentage is usually 50%. Most of Witkin's photographers work with him on a consignment basis, but occasionally, with young photographers, Lee buys one to ten prints outright. He puts emphasis on wanting to be supportive of new talent, but he also notes that "no one ever buys them. We must have spent \$5,000 last year buying prints of young photographers that are still sitting here."

It is true that, by and large, young photographers' work does not sell well, but perhaps part of the blame lies in Witkin's underplayed selling tactics. Gene Smith calls Witkin a "low key exhibitor." Basically, the gallery is a repository of photographs, and people know to come to Witkin as a photographic source. The gallery is listed in major publications and sends out a mailing to 1,700 people every month. A catalog, published every year for the past four years, lists all photographers represented by the gallery and serves as "our emissary, our ambassador, our salesman," says Lee. Work is available to be seen at the gallery and anyone can at anytime peruse through the bins of pictures.

Sherry Suris' work, recently taken on by Witkin, has been "on display" in the sense that it has been in the bins and Sherry expressed surprise at how effective that not-so-obvious exposure has been. Within two weeks of being with the gallery, Sherry had two sales. For a photographer who has a show, the only responsibility is to provide the

prints: Witkin takes care of the framing, matting, lighting, printing the mailer, and advertising.

Gene Smith likes the soft sell of Witkin. "I would hate to be in a high-pressure gallery," says Smith, "where everything is exploitation and pushy. I couldn't take it."

Witkin has had corporate sales, but Lee admonishes, "We haven't gone to Howard Johnson's and suggested that they have an Edward Weston in every room. . . . I never opened the gallery as a Sears Roebuck and it's true there's a very valid need for Howard Johnson's to have prints and a lot of people get pleasure out of it; I don't want to be a snob, it's just that I would prefer to be dealing on a one-to-one basis with people and leave the mass marketing of material to someone else."

Witkin represents his photographers on an exclusive basis only in New York because he feels it "is the only place I can give them the kind of representation that lets me demand exclusivity." Other photographers, Witkin notes, have signed up with bigger galleries on an exclusive *international* arrangement, but that is something Lee says "a small gallery such as mine is in no financial position to do."

Witkin concedes that increased competition has probably helped more than hurt by "making a wider audience as far as business goes." But he feels that it has hurt in that it has "turned photography into the bitch art world just like everything else. . . . It's big time and any big-time operation experiences that. But there is a good deal of my feeling that's sour grapes. I can't hide my own thoughts. I had everything to myself and now I don't. But I think 90% of my statement is based objectively on the truth that the good will and the genuine qualities of the field both in collectors and in photographers has changed radically."

Witkin complains that he is being further "forced into doing things." Many of the other galleries send a staffer on a selling trip and though Lee has not yet done that sort of thing, he is planning to. However, he is vehemently opposed to considering expansion to the point of opening up another office, on the West Coast, for instance, and asserts "I'm not of that particular mentality or emotional caliber. I know what I like and I'm going to try to do it. I don't see why I should be forced into an expansion that would destroy the things that I like. It's already pushed me to a great extreme away

"I know a photographer who was recently approached by an art gallery, and he showed his work and they said they were interested, but he would have to decide if he was an artist or photographer. If you're a photographer, you're worth \$200, if you're an artist, you're worth \$500 or \$1,000."

—Duane Michals



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"When I began the gallery 29 years ago, I had a list of exhibitions that would last about 30 years. So I didn't really have room to slip in photography until very recently. We're finding more opportunities of doing it now."

—Sidney Janis



from what I like and I don't see why I have to be pushed any more."

Witkin feels that his photographers should decide whether they want to be hustled around the globe by certain galleries that have certain reputations or would "prefer to be handled by someone who they have sympathy with as far as how the director's operation is run." Lee says, "If someone doesn't want to be with me and can get a better deal elsewhere, then I think he should leave. A lot of photographers have stayed with us: Cole Weston has been very loyal. Imogen [Cunningham] was until the very end." But some photographers have not remained: Berenice Abbott, Bill Brandt, Brassai, Lee Friedlander, and Robert Heinecken, to name a few.

Lee Witkin's commitment is to be "true" to himself and he feels that by "running the gallery as honestly and as tastefully and intelligently as possible, I'm doing the greatest service to the community. I'm not a crusader. I never intended to be. I did something that I cared about in the best possible way I could do it and it helped everybody. And I continue to do it my way. I think if someone is true to oneself and one's own standard then you can't help but benefit other people."

PACE GALLERY (32 East)

In our efforts to reach all the galleries for comments, we contacted Pace Gallery several times and emphasized the desire to include Pace in our article. Each time we were told that director Arnold Glimchar was unavailable for comment. However, we did talk on the telephone with artist-and-photographer Lucas Samaras who is represented by Pace Gallery. Samaras has been with Pace since 1965 when he showed his sculpture there. It was six years later, in 1971, that he showed photography.

Samaras points out that it is not Pace's policy to deal in photography, but that he and the gallery have a special relationship because Pace handles all aspects of his work. His immediate feeling is that Pace will not be dealing with photographs other than his at any time.

IMAGES GALLERY (11 East)

Images is another story. It is the story of the first photographic gallery specializing in color. The men behind the imposing metal door at Images are Bob Persky and Stuart Levy. We talked at length with Bob Persky in his small office at the back of the gallery.

Neither Persky nor Levy have formal backgrounds in art. Both are businessmen. Persky candidly comments, "I would not consider myself an expert in art. This is my first venture in a gallery." What prompted the new direction? Bob related that initially when discussing the concept of the gallery, both he and Stuart realized that "although a splendid job was being done in vintage photography—contemporary black-and-white photography—by and large, color was being ignored or was an afterthought in the artistic scheme of things." But "first," he continues, "I had to believe in color photography as something I thought people could react to and buy and accept as an art form. Then I had to decide, would it eventually become viable." He is quick to assert that "We didn't enter this enterprise merely to make money because if we did we would have been much better off selling Dannon yogurt."

Mitchell Funk, one of the Images' photographers, feels a color gallery "should be a two-fold thing: it should be pushed commercially to make money and it should get artistic recognition." Funk hopes "Images serves that purpose."

Images opened in the fall of 1976 with a "Horizon Show," an assemblage of 100 prints from the work of 20 photographers. Persky said the intention was to show the wide range of artistic interest in color photography "ranging from a very literal—the simplest shot in the show might have been a pond with some weeds—to some very complex work with sandwiches and completely abstract work by [Glenn] Heller and others." The gallery directors wanted to get across a feeling of what was available. However overhanging the exhibit was, "it really did awaken in many of the people who came to visit, the feeling that photography was more than recording the family picnic or some social event. I can't tell you how many people came in and said these can't be photographs, they must be paintings."

During his exhibit at the gallery following the Horizon show, Alan Dennis overheard a woman in a corner say "Oh gee, I've got this Mediterranean room and this seascape would look great." The audience, Dennis feels, has "absolutely no idea about photography. They couldn't care if it's a photograph, a litho, a painting; it could be anything. They like what they see and that's a really interesting concept as far as a gallery is concerned. I think that the original concept of galleries a long time ago was to expose an art form to the public. Images is doing it with photography."

When deciding on a location, Persky was very interested in being where there was a "good traffic pattern" especially for a new gallery idea. So 57th Street was a natural. Dennis also finds the location attractive. "If images would have opened somewhere else, I don't know if I would have been as excited. . . . To show on 57th Street!"

From many visits to other galleries, Persky and Levy came away with

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specific ideas about what their gallery should look like and consequently Images introduced new dimensions to the traditional art gallery: colored walls and music. "We found that most color photographers agreed that a dark background was something that could really display color work to advantage. And then we decided that we would have an FM set on all the time. . . . The music makes you feel a little less like you're an intruder." The carpeted, dimly lighted main exhibition area with brown suedish walls has dividers that isolate one photograph from another in individual niches, illuminated by track lights. On the upper exhibition level, photographs are hung close together in rows (but little space is provided for a viewer to step back for proper viewing). A room at the front end of the gallery has been designated for slide projection, with seating on rich-brown leather sofas. Light peeks through blinds covering the front windows, but aside from that, no natural light enters the gallery. Persky does not want Images to intimidate a gallery goer as he thinks other art galleries do. He wants to avoid having visitors feel awkward and thus Images offers an atmosphere less associated with protocol.

To find and establish their "family" of photographers (which now numbers about 25), Persky and Levy approached color labs, read photography magazines, ran ads in the *Village Voice* and the *Berkeley Barb* to "pick up people" who might not be working commercially and making prints but have photography in their head as an art form. People who might be working in their own labs so no commercial lab would find them." In addition, he spoke to people who led him to other people. The goal was to include unrecognized photographers in their family as well as the established artists, but "without a duplication of the type of photographer."

Persky schedules at least one day a month to look at portfolios and prefers to look at slides. "The last time was last week and I had 14 or 15 photographers in here," Persky reports. He says that "People come in here and say 'I have a wonderful series of photographs on the Lebanese War or a trip to South Africa.'" But Persky is not interested in that type of material for Images: he suggests that such work would be better suited for *National Geographic*. What he wants is something the viewer can react to and want to live with for a long time. And on the issue of the more enigmatic

styles of photography, Persky says, "I don't subscribe to the theory that art can be appreciated only after a long esoteric explanation."

When researching the galleries, Persky decided to get away from bins of prints, so he settled on slide formats. Each photographer is represented by a portfolio, usually in slide form, of only color work and only what the photographer is interested in selling. Persky made a point of saying that he never goes into his photographers' files to ask for prints. Work he wants consists only of photographs not taken for commercial purposes. Mitchell Funk, as he understands his contract, assumes that Images thus represents only the photographs of his that it physically has on hand. "I couldn't possibly give someone the hundreds of shots I've taken because it's my life, my living, and other things."

All work is handled on consignment. Exhibit prints are the photographer's expense and the photographer owns them. (Alan Dennis' show of dye transfer prints cost him \$13,000 and Mitchell Funk spent roughly \$5,000, sharing a show with another photographer.) The gallery absorbs all other costs. They pay for invitations, announcements, cocktail parties, etc.

The arrangement on sales is: from the sale price received, the gallery first returns the cost of the print to the photographer; after that it is a 50-50 percentage breakdown. There are two reasons such a formula was devised: one, Images wanted the photographer to feel free to use the best color lab to get the best-quality work; and two, though Images may not make a profit on the first print sold, hopefully the second one—which will cost the photographer less—will be profitable for both gallery and artist. The photographer receives payment within the first ten days of the month following the gallery's getting paid. Although there are deviations in other arrangements, the gallery commission is standard with everyone.

Images represents its photographers in New York, but as Persky says: "If we get a gallery affiliation for them in Chicago, then our contract could be extended to the Chicago area, but up to that point they are free to make their own arrangements in Chicago."

With most of his photographers, Persky has a written contract for a five-year period. Mitchell Funk, however, worked out and signed a three-year agreement. For Funk, "Five years is out

"I knew the photography scene here [Paris]. I'm tired of moving one-ton pieces of sculpture. It's very nice to handle photographs physically. And the space is perfect for photography."

—Virginia Zabriskie



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"The responsibility of making a \$1,000 print is too much."
—W. Eugene Smith



of line" as far as he is concerned. "It's too long a tie." Even three years he feels is questionable, but says, "You have to give it some time that's reasonable." Persky has good reasons to ask for such a commitment from his photographers, he says. He emphasizes the fact that he is taking a big risk trying to make a viable enterprise out of the gallery and he needs his artists to stand with him. "I didn't want to find," he says, "that we had established color photography and then have someone like Marlborough walk in with their millions and say to our photographers, 'It's great. Images has gotten you started, but we can offer you more.' I can't get into a bidding war with one of the big oil painting conglomerates. I can't win that."

For Funk, the ensuing relationship with Images is simply "I've dealt with them; we've spoken. I'm not intimate. I'm not friends with them. It isn't in any way a personal thing. It's a business property."

Images wants to carve out a market. Persky speaks knowingly of surveys and statistics and points to them to support his goals. One survey, done in January, 1976, for a graphic arts society considering marketing photography, posed the question, "Who is the photographer best known to you?" The results, relates Persky, showed Ron Gallela the winner, with Ansel Adams second. "So this gave us a clue to where the heads of the public were at." Persky recognized that the public had to be educated and Images has several publics. One function of the gallery is a formal program of inviting students from photography schools and high schools down to the gallery to see and meet with one of the photographers.

Persky stressed that people need to be educated; not those in the photographic industry, but people who

may be potential clients of the gallery. "People do not automatically think of photography when they think 'how can I enhance the environment of a building, lobby, or a reception room or a private office.' " Images sees color photography competing in a strong way with every other wall art form and wants to see photography occupying such space as well. People should start to consider color photography equally with oils, believes Persky. "If they are going to put an expensive oil up, then I would like them to also consider a 40x60 dye transfer." In this sense, he feels his market is different from the black-and-white market "to the extent that most black-and-white photography doesn't pretend to be an art form as opposed to artful composition or artful recording of an event. . . . It would be foolish to say that no one could hang a Diane Arbus type portrait on the wall, but I think more people are inclined to hang something that is upbeat rather than downbeat."

Images has a sales force that approaches both institutions and corporations having an interest in art, to suggest that they consider photography. Some have. Acceptance by such groups, Persky feels, would influence others to recognize color photography as an art form in the same category as oils. Another target group for Images is interior designers and architects. "We're interested in these people because in a sense they are the tastemakers; they guide large numbers of the public into areas that they have not yet explored.

Alan Dennis comments, "Decorating with photography, that's what it is. I don't mind the word. I am not hurt by it." Funk says, "I think that the best audience to sell to would be interior decorators, designers, industrial outfits, hotel chains. A hotel could redecorate their walls; instead of with the junk art they might buy at \$50 or \$75, they can get original

photographic things." And to facilitate the purchase of prints, Images accepts payment by Master Charge.

Persky does not think that it is the gallery's function to edit or to censor where artwork is exhibited. He does concede, however, that if he were an artist, "I probably would rather say I am in the permanent collection of the Fine Arts Museum in Boston or the Metropolitan. But some artists are also interested in public exposure." Images is trying to direct in a constructive way because, Persky explains, "I think there will be a trickling down from the recognition at the top to the bottom. Art does not trickle up from the masses, it trickles down from those who make taste."

Does a specialized color photography gallery have reason to be optimistic? "Last week was our fifth month of operation," says Bob Persky. "Our projections in sales have been on target. They were modest."

LIGHT GALLERY (724 Fifth Avenue)

It was a major face-lift when Light relocated in October, 1976, from the cramped, white-walled space at 1018 Madison Avenue to their present, plush surroundings (said to be custom-designed around photographs and Light staffers' requests for workability). Light had occupied the smaller uptown space since opening in November, 1971, when it became one of the first exclusively photographic galleries to appear on the scene two years behind Witkin. Owned by attorney Tennyson Schad, who has a strong interest in photography, Light was originally directed by Harold Jones, former assistant curator at George Eastman House. In about April, 1975, Jones accepted a position to head the new Center for Creative Photography at the University of Arizona in Tucson, and a young Harvard graduate, Victor

Schrager, who had been working at Light since January of that year, seemed to be a candidate for Jones's replacement. By fall, 1975, Schrager, who had glommed all his gallery experience during those six months at Light, officially became its director. In the-less-than-two years since, this young man has helped to maintain Light's prominent role.

In his office—its large windows overlooking Fifth Avenue, its walls loaded with photographs, Victor Schrager, dressed in jeans and a crewneck sweater, talked candidly about the Light philosophy. "Light is a humanizing place, it's not just a retail outlet. We are not a high-pressure sales gallery where we have floor walkers walking around trying to sell photographs. We don't even sell very much off the walls . . . The idea is to show people new ideas, work that changes, the way the photographers work."

Light does not have a specific style. It is not a formalist gallery, or a manipulated photography gallery, but tries to "promote the maximum differentiation between individuals," says Schrager. The underlying intention is to present a group of photographers that is as representative of the significant developments in 20th century photography as possible. Light is an amalgam of all styles and Schrager hopes it presents "something accurate in terms of the history of photography and ideas."

One might surmise that Light has a marked propensity to present contemporary photographers. Victor thinks "contemporary deals with how photographers related to their times; when photographs were made—whether in 1915 or 1975. Paul Strand was a great contemporary photographer because his ideas were always forward; they were always growing and changing. He's not one of these guys who developed a formula for working. And the same thing is true of Sommer, Callahan, Siskind, Bishop, Jones." At Light, Schrager is intent on showing "new pictures to try to get people to relate to how some adult person might live his life in photography." After all, these photographers are "not hobbyists and they're not amateurs, nor are they professionals. They're artists. So I try to make Light work like they work."

Duane Michals (once represented by Light and now with the Janis Gallery), calls Light "the maverick . . . the avant-

garde gallery that shows a marvelous range from Benno Friedman to really very reactionary people." Some photo connoisseurs, however, object to this very "range." They accuse some of Light's artists of not being photographers, such as Bill Larson who does holography and transmission photographs; and they challenge such work being in the company of Aaron Siskind's. But Schrager does not really worry about the reactions. He thinks it is "healthy and exciting and interesting."

Meanwhile, Bill Larson is pleased to be handled by Light. He views it as a nice commitment on their part, especially since his work—of a rather unconventional nature—does not tend to promote great sales. The fact that Light is open to showing his work, Larson believes, is a kind of service to the picture-looking audience. "It begins to elevate their consciousness about other kinds of photographic things and that's good." But Larson recognizes that "it's at a risk," Schrager seems to think the financial risk is unimportant. "Light's not specifically in business to make money for Light," exclaims Schrager. "It's in business to stay in business and to have enough money to be as good as it wants to or as good as it can." Another Light photographer, Arnold Newman, independently supported the attitude with his comment: "I don't think you can run a successful gallery if you are purely motivated by money. It's impossible because you wouldn't know enough about photography, painting, antiques, etcetera."

Light now represents about 30 photographers. Though Schrager does not want to give the feeling the gallery is closed to new photographers (he does always look at work), he is not "dying" for new people right now. The impression he gave is that he has quite enough to contend with 30, which he admitted is "like being married to a lot of people and it can be very draining."

For many of the Light photographers, part of the attraction in remaining with the gallery, it seems, is centered around the trusting, friendly rapport that has developed for them with Schrager and his staff. For Stephen Shore, the gallery sometimes serves as a place just to "hang out and talk." He likes the people and occasionally will go up just to enjoy an informal afternoon. For Arnold Newman, a lot of importance is placed on working with people with whom he is comfortable, and with whom he can work out business arrangements with a

"...when you take your work to a commercial gallery or show your work in public, you want to sell prints. And there's nothing wrong with that."

—Paul Katz



Mirror Lenses:

THE FAT CATS OF PHOTOGRAPHY

HOW TO USE THEM

By Lief Ericksenn



Vivitar 600-mm f/8 Solid Cat.



Hand-held close-up was taken with 500-mm f/8 Spiratone Ultratel, extension tube, and electronic flash.

Believe it was Archimedes who figured out that if he had the army of Syracuse polish their shields and stand in a parabolic arc along the cliffs, they could focus the Aegean sun on the sails of the invading Roman ships and set fire to them. Since then, the spherical or parabolic mirror has been on our side, giving us such goodies as the magnifying shaving mirror, the Hale 200-inch reflecting telescope, and of course, the catadioptric lens.

Mirror lenses don't differ much from conventional optics in what they do, only in the way that they do it. Instead of refracting (bending) light by passing it through a conventional lens to bring an image to focus, a mirror lens uses an aluminized-surface spherical or parabolic mirror to collect the light entering the lens barrel and assemble it into a usable image for the camera.

Thus a mirror lens is a reflector in that the light is bounced off the surface of the primary mirror. Because mirror lenses (with one exception) do not pass light into the surface of the primary, they are free from chromatic aberrations (color fringing) around the image. Therefore, they do not require an assembly of glasses with different refractive indexes to cancel out such aberrations, as do conventional-type lenses. As with all simple explanations, the above is only partly true. There are a number of exceptions, including the Mangin mirror, which is aluminized on the back and thus acts as both a refractor and a reflector.

To further confound simple explanations, it should be noted that a modern mirror lens is a hybrid system that employs both mirrors and conventional lenses. This type of optical

legerdemain leads us to the catadioptric lens, or "cat" for short. Light entering the barrel strikes the spherical primary mirror, which is located at the bottom of the tube. This mirror focuses the light and sends it back up the barrel to a flat aluminized-glass secondary mirror whose function (in a mirror telephoto designed for general photography) is to return the light down the barrel via a series of conventional lens elements and onto the camera film plane. Why use conventional lenses in a mirror system if mirrors are so all-fired good? Partly, they are used to aid in the final correction of the image produced, but mainly to act as field flatteners, since a mirror likes to project a curved image plane that would be useless for a camera since camera film planes are flat.

You will sometimes hear of a cat lens



Mirror lens lineup: (left to right) Celestron 1,250-mm f/10, Nikkor-C 2,000-mm f/11, Spiratone Ultratel 500-mm f/8, Minolta 1,600-mm f/11.

being referred to as a Schmidt-Cassegrain or a Maksutov. Cassegrain refers to the way the image is made to exit through the main mirror, along the optical axis of the lens. This places the camera directly behind the lens, making the whole outfit easier to handle, aim, and focus, since in this respect it is like any other lens you might hang on the camera. In fact, the mirror lens traces its descent from an astronomical reflector designed by Cassegrain. The improvements in performance come from the addition of either a Schmidt corrector plate or the allegedly simpler Maksutov corrector plate. The Schmidt plate is an aspherically figured lens that applies first correction to the light rays before they strike the primary mirror. The Maksutov corrector is a deeply curved meniscus lens, also situated at the entrance to the lens barrel, that functions the same way as the Schmidt. Both corrector plates have a secondary function, which is to support the flat mirror that is cemented to the underside of the corrector plate and accounts for the Cyclopean look of a mirror lens.

Mirrors are often referred to as being accurate to 1/8 or even 1/25 of a wave. This figure represents the resolution of

the primary mirror when tested at the short (blue) end of the visible spectrum. Such accuracy is totally wasted if the whole lens is not assembled with great care and precision. Indeed, when a mirror lens is properly made (and all of those I tested were immaculate), it is as good as any conventional tele-objective available.

A nice thing about mirror lenses is that they use the same point of focus for infrared as they do for the rest of the visible spectrum, thus doing away with the chore of shifting focus to accommodate infrared work.

An interesting question is how to focus a mirror lens. If I wanted to be flip, I would say, "with great care." However, this advice applies to conventional supertelephotos, not just cats. More of that anon. Ideally, all the components of a mirror lens should be locked rigidly at their appointed locations in the lens barrel. Focusing the lens would then be achieved by moving the camera body toward or away from the primary mirror. Indeed, one famous mirror lens uses a bellows system to achieve just this. Alas for perfection, most photographers will not sit still for this system, declaring it to be somewhat vulnerable in the rough

and tumble of photographic life. Rightly or wrongly, most lens makers seem to concur with this view and the camera body is mounted onto a rigid tube behind the primary mirror. Focusing is achieved by several systems, which usually involve moving either the primary mirror, the secondary mirror, or the secondary optics.

All the lenses tested used one of these three systems and proved to be just as tractable either way. Focusing any supertelephoto lens requires great care on the part of the photographer. However, a mirror lens needs special attention for the simple reason that there is no easy way of stopping it down; you just can't use increased depth of field to help compensate for sloppy focusing. Since a mirror lens has only one fixed aperture and concomitantly only one fixed depth-of-field ratio, it behooves the photographer to be dead on.

Supertelephotos (refractor or reflector) are not helped by the focusing screen usually supplied with the 35-mm SLR of your choice. The split-image rangefinder and microgrid screens so beloved by SLR users shadow out with even moderate tele lenses. They are even worse with a narrow-angle supertele, since the central part of the screen is rendered useless. The best screen for this use is a finely etched groundglass with no focusing aids built into it. If you own a camera that has interchangeable screens, then you are sitting pretty, since it is but a moment's job to pop in the right screen. However, if your machine is of the fixed prism and screen type, your only alternative is to send the camera to a repair shop and have the correct screen installed. I



Doughnut-shaped out-of-focus highlights are characteristic of mirror lenses.



Egret was captured with a 600-mm f/8 Vivitar Solid Cat, hand-held at 1/1,000 second.

personally detest rangefinder screens and immediately change to a fine-etch mat screen even for wide-angle work.

Why can't a diaphragm be installed in a mirror lens? It's impractical because of the hole in the mirror and also the heavy internal baffling required to prevent off-axis (skew) rays from degrading the image contrast. Stopping down a mirror lens with a diaphragm would eventually lead to no light passing through the hole to the film. It's the hole in the mirror that produces those ring-shaped, out-of-focus highlights that are the signature of a mirror lens. A cat lens can be "slowed down" by the addition of a filter in the light path. A neutral density filter may take an f/8 mirror lens down to f/22 light transmission, but it in no way alters the depth of field, which in this instance remains a product of f/8.

The chief advantage of the

catadioptric lens lies in its combination of extreme compactness and enormous focal length. Consider a lens such as the Minolta RF Rokkor-X, which is 322.5-mm long physically yet delivers an effective focal length of 1,600-mm. This feat is accomplished by folding the light path several times. In addition, a mirror lens is generally lighter than its more conventional refractor equivalent, again because of its optical design and employment of mirrors rather than lenses. There is virtually no limit to the size of a primary mirror. Consider the huge 200-inch Hale reflector at Mt. Palomar compared with the largest refractor, which is (I believe), the 60-inch telescope at the Yerkes observatory. Largely, this is because a mirror is supported on its back in a cradle, which reduces the gravity-load on the glass. A conventional lens must, by virtue of its

design, be supported on its circumference. I, for one, would rather carry the massive 2,000-mm f/11 Nikkor-C mirror lens, which weighs 70 pounds (on its fork mount), than its equivalent in a refractor. This situation is slowly changing, however, due to new lens designs and the lighter, brighter fluorite glasses that are entering the market.

As far as cost is concerned, mirror lenses compare quite favorably with their refractor counterparts, especially in the more moderate focal lengths. The Spiratone 500-mm f/8 Ultratel cat is only about \$150, complete with the T-mount of your choice and a short set of extension tubes that allow you to get even closer than the lens's nearest focus point of 13 feet. The Ultratel, by the way, is an excellent lens and ideal for those of us on moderate equipment



Vivitar 600-mm was hand-held at 1/500 second for buzzards.

budgets. Going from one end of the dollar scale to the other, the Nikkor-C 2,000-mm f/11 cat is just shy of \$9,000, complete with its massive fork mounting. The fork mount, which looks as though Nikon lifted it from Mt. Palomar, is an optional extra, but if you are in the market for Nikon's piece of optical pulchritude, I suggest that you buy it with the lens. Using the 2,000-mm Nikkor-C gimballing from its stainless steel trunnions on this mount, I was able to pull off acceptably sharp shots with shutter speeds as low as 1/30 second, no mean feat for a supertele. Besides which, I know of no tripod that could support the Nikkor-C without introducing vibration.

The Minolta RF Rokkor-X, 1,600-mm f/11 cat is surprisingly short for its enormous reach. As stated, the barrel length is a mere 322.5x178-mm diameter and the lens weighs a comparatively trifling 15 pounds. No, it is not hand-holdable, except possibly when panning a fast-moving object. (The laws of momentum being what they are, a certain amount of gyroscopic stability is introduced once the mass of the lens/camera is in motion.) A good tripod is mandatory for precise work. Both the Minolta and the Nikkor focus to just under 70 feet, yielding a full head shot

and a full face shot, respectively. This is the end of the focusing scale that is the most useful, as far as I am concerned. The Celestron Schmidt-Cassegrain f/10 1,250-mm mirror was the next-longest lens tested, and despite its somewhat Spartan appearance, it turned out to be a good, sharp, contrasty lens. Derived from Celestron's excellent line of astronomical mirror telescopes, this optic is a lightweight, coming in at a fraction over 5 pounds with the camera tube and T-mount attached. Theoretically, it is hand-holdable, but I think that that is an overly optimistic assessment of most photographers' capabilities. Focusing the Celestron f/10 1,250-mm mirror is done the same way as the Nikon, by means of a vernier screw on the rear of the mirror housing. Whereas there is absolutely no possibility of hand-holding the Nikon, you might be prepared to try it with the Celestron. I hope you can juggle, because it's hard enough to hold a supertele steady without trying to focus it at the same time.

A relative newcomer on the civilian photo market is the Vivitar 600-mm f/8 Solid Cat, developed by Vivitar and Perkins-Elmer. I fell in love with this lens at first sight. Five inches long from the tip of its stubby lens shade to the T-

adapter, it is an extremely portable optic that should encourage photographers who hitherto have been reluctant to try superteles because of their bulk. Even with a 2x tele-converter behind it to boost the focal length to 1,200 mm, it is still very manageable. Focusing, as with the Spiratone 500-mm Ultratel, is by a conventional rotating sleeve on the lens barrel. Both the Vivitar and the Ultratel imply hand-holdability because of their compactness. Be that as it may, they are still very long focal lengths, and the old rule of thumb that states that "the focal length is equal to the lowest hand-holdable shutter speed" still applies. A good tripod makes a fine lens better, and at the very least you should stabilize the camera/lens rig by leaning against any rigid support that you can find. I have absolutely no complaints as to sharpness and contrast in any of the lenses tested, just a few minor nits to pick.

The Nikkor-C 2,000-mm f/11 cat uses a revolving turret, built in behind the mirror, to carry its filters. The filters are an L-37, an R-60, an O-56, and a Y-48—terrific if you don't need filters for color. Since the only filters I use for color are the neutral density and polarizing types, I find Nikon most remiss in not including at least an ND in the turret.

The Minolta RF Rokkor-X has a slot system immediately in front of the camera mounting-tube bayonet. A set of filters, including a neutral density, are supplied in a natty leather case with the lens. My gripe about the RF Rokkor-X is the focusing system, which at first I thought I liked and then came to hate. Minolta shifts the secondary mirror by means of a lever that runs around approximately one-third of the lens barrel circumference, near the front. Alas, the lever is on the right-hand side of the lens. Since most cameras are "right-handed," with all the major controls located to fall under the right hand (which is therefore busy controlling such niceties as shutter speeds and film advance), how do you focus the thing? You reach over the lens barrel with your left hand! Try it and you will see what I mean. It would be better if Minolta had placed the focusing lever over the left-hand side of the lens. If ever there were a plug for an aperture-priority automatic camera with an electric film winder, this lens is it.

The Vivitar 600-mm will only focus
continued on page 113

Mirror Lenses: THE FAT CATS OF PHOTOGRAPHY HOW THEY WORK

By Bob Schwalberg



*A wondrous beast is the cat,
Its optics all folded quite pat.
Its focal length twice its physical size,
And the aperture absolute stat.*

Lief Ericksenn

Although light and vision were studied by the ancient Greeks and the Arabs, the technology of applied, or instrumental, optics dates back only to the beginning of the 17th century, with the Dutch developments of the first microscopes and telescopes. Mirror systems, which form images by means of curved reflecting surfaces, rather than through refractive lens elements, are very nearly as old.

Photography became a serious subject only after Arago's announcement of Daguerre's mercurially processed silver-iodide plates in 1839, and its optical beginnings owed much to earlier experience with the correction of astronomical telescopes. Two early American daguerreotypists, Alexander S. Wolcott and John William Draper, used single concave mirrors instead of refractive lenses for cameras built and used in 1840. Wolcott claimed that this

design permitted 90-second exposures in sunlight.

(For a complete description of Wolcott's mirror camera, see page 139 of *The Camera*, a volume in the *LIFE Library of Photography*, Time-Life Books, New York, 1970.)

John William Draper (1811–1882), an

Anglo-American physicist, chemist, and photographic pioneer, sometimes credited with having made the first portrait of a living person (in 1839), and the first photograph of the moon (in 1840), also designed a number of similar mirror cameras. One of these is shown in Fig. 1.

Definitions of Optical Terms

Spherical aberration occurs when rays from the edges of a spherical lens or mirror come to a shorter focus than rays from the central portion of the spherical surface.

Coma appears when off-axis images (or points of light) record as comet-like shapes with a trailing tail.

Astigmatism occurs because an off-axis image point "sees" the lens or mirror as a sort of ellipse, instead of a circle. As a result, the lens is unable to record sharply both the spokes and the rim of a wheel simultaneously.

Distortion is the failure of the lens to provide equal image magnification over the whole image field. Instead, the picture of an object containing straight parallel lines may bulge outward (*barrel distortion*), or inward (*pincushion distortion*). Distortion, more correctly *rectilinear distortion*, affects the

shapes of images, but not their sharpness. **Field curvature** occurs when the lens or mirror system is unable to bring all of the image points to best focus on a flat surface. Usually, field curvature is concave to rays. **Chromatic** aberrations take two principal forms: *axial* chromatism, in which the red rays come to a longer focus than the blue ones, and *lateral* chromatism, in which the blue images of off-axis objects appear farther from the center of the lens than the red images. Axial chromatism causes a change of focal length with color, lateral chromatism a change of image magnification. In addition, *spherochromatism* is a combination of spherical and chromatic aberration; the central and peripheral rays don't come to individual focal distances, but fan out according to their colors.

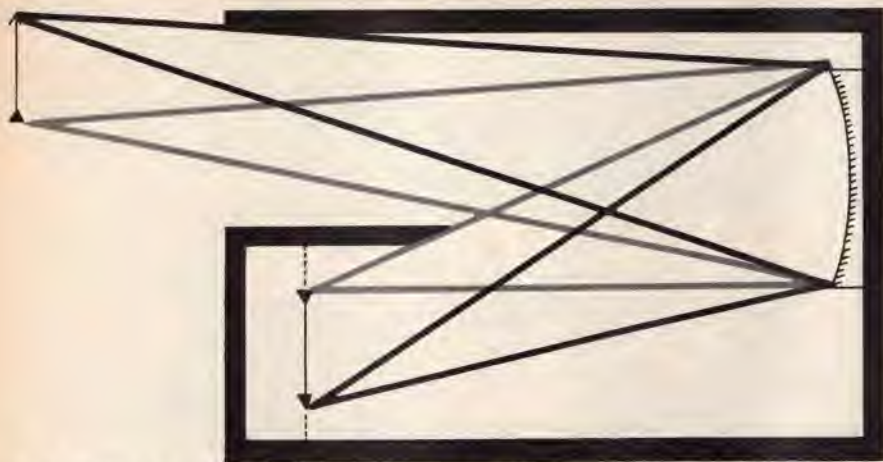


Fig. 1. Draper's mirror camera with baffling to block off stray light. From *The Encyclopaedic Dictionary of Photography*, edited by Walter E. Woodbury, Scovill & Adams, New York, 1898. The object (arrow) is shown much too close for reasons of compactness; with a realistically more distant object, the short horizontal baffle will extend farther inward toward the mirror.

Draper's 1839 daguerreotype of his sister was made in bright sunlight, using a conventional Chevalier type achromatic lens of the day, with an aperture surely no greater than $f/16$. Poor Dorothy Catherine was required not only to remain rigid during John William's 30-minute exposure, but to submit to having her face heavily powdered with white chalk.

If Draper's 30-minute, and Wolcott's 90-second exposure data can be trusted, it can be deduced that the mirrors were operating at apertures of about $f/4$. The pro's and con's of mirror-camera photography were aptly summarized in the 1911 edition of *Cassell's Cyclopaedia of Photography*, London, recently reprinted with a new

historical picture section by the Arno Press, New York, 1974:

"The advantage gained was the possibility of shorter exposures than were feasible with small aperture lenses, and the absence of chromatic aberration; but it is difficult to avoid a certain amount of stray light, and the mirror has to be large to compensate for the obstruction of illumination caused by the plate and its support. Concave mirrors are of value in stellar photography, where any stray light met with is but feeble."

In effect, the Wolcott/Draper cameras were simplifications of Newton's telescope (see Fig. 2.) in which the 45-degree secondary mirror was eliminated, and the sensitized plate was placed at

the focus of the main mirror.

The Newtonian is one of the three basic astronomical reflectors, and because of its great simplicity, this form remains the favorite of amateur astronomers the world over who build their own telescopes. Sir Isaac Newton made his in 1668, but published no information until he had produced an improved version in 1671. More complex, and theoretically more correctable reflecting systems were originated by James Gregory, in 1663, and by an obscure French sculptor, Guillaume Cassegrain in 1672. These are shown in Figs. 3 and 4.

As a matter of terminology, the larger reflecting surface at the back of each system, which serves as the objective to receive light from the distant subject, is known as the "main," or "primary" mirror. The smaller internal reflectors that redirect the folded light rays are called "secondary" mirrors, and their forms constitute the principal differences between the three classical reflecting telescopes.

It is, however, even more important to note that none of these telescopes uses a spherical main mirror, these being in each case paraboloid. In practice, the telescope-maker begins by grinding a spherical surface. Hand "figuring" is then applied to achieve the necessary aspherical final curvature. The parabola is one of the four so-called conic sections, illustrated in Fig. 5.

A purely spherical mirror, as in Fig. 6, can be completely cured of coma and astigmatism by locating the limiting aperture stop for off-axis rays exactly at the center of curvature of the mirror. Such a surface will still have spherical aberration, and its image field will be curved, as shown by the dotted line.

Most optical texts emphasize that the spherical aberration produced by a spherical mirror is only $1/8$ of that caused by a single equivalent refracting lens. This is because the mirror requires far less curvature to achieve the same amount of bending. The point remains, however, that refracting lens systems are corrected by means of a series of elements, and spherical aberration is a principal problem for all reflecting optical systems. The spherical aberration of a simple spherical concave mirror is shown in Fig. 7.

Parabolic mirrors can completely cure spherical aberration, as shown in Fig. 8. This, incidentally, is why they make such fine reflectors for pocket flashlights and

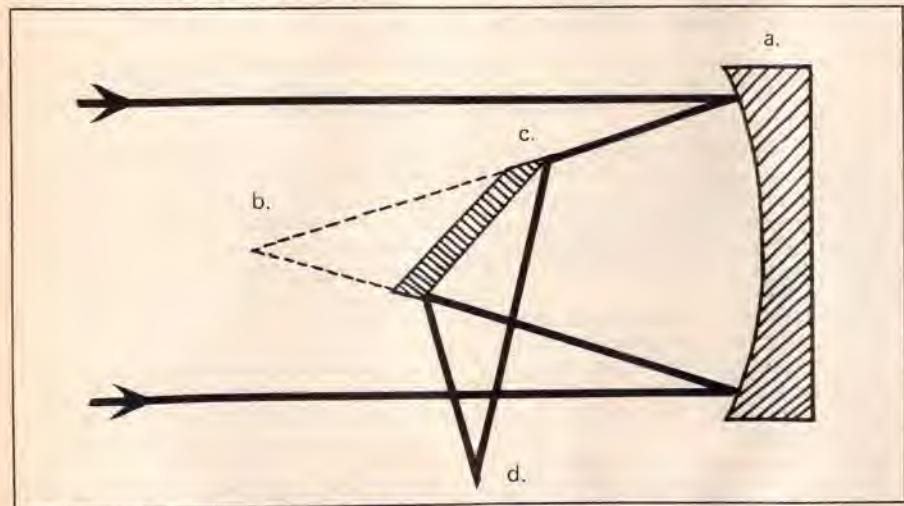


Fig. 2. Newton's telescope. Rays from an infinitely distant object are focused by paraboloid main mirror (a) toward axial point (b), but are intercepted by flat secondary mirror (c), and brought to a side focus at (d). Point (d) is the "prime focus" of the reflector. Ordinarily, an eyepiece lens would be focused on this real image to provide a virtual image for the eye.

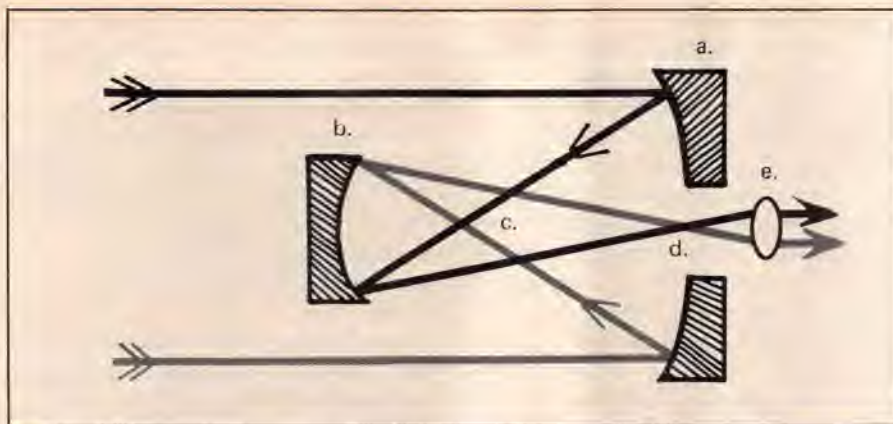


Fig. 3. Gregorian telescope. Main mirror (a) is concave paraboloid with central opening. Secondary mirror (b) is concave ellipsoid placed just beyond focus of main mirror at (c), and is refocused at (d) where it is viewed by eyepiece lens (e).

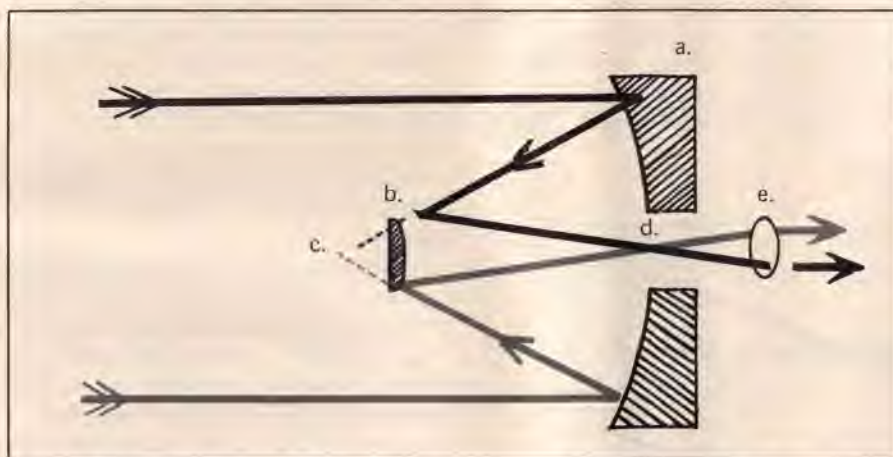


Fig. 4. Cassegrain telescope. Main mirror (a) is same as in Gregorian form, but secondary (b) is a convex hyperboloid placed in front of prime focus at (c). Again, as in the Gregorian form, rays are refocused to (d), where they are viewed with eye lens (e). Note that Cassegrain form produces an inverted image (like a camera lens), while Gregorian eye lens image is erect (as in terrestrial telescope).

photographic flash units. Remember that all geometrical image phenomena are reversible: if the parabola brings parallel rays to a common focus, then light originating at this focus will be reflected outward as a parallel beam.

Unfortunately, however, the parabola brings back the coma and astigmatism that were eliminated in the spherical mirror by location of the aperture in the center of curvature. By relocating the stop at the focus of the parabolic mirror, this astigmatism can be eliminated, and the coma reduced. In this case, the image field is formed without distortion on a curved surface whose radius is about equal to that of the focal length of the parabolic mirror.

Additional field correction is obtained from the aspherical curvatures of the secondary mirrors of the Gregorian and Cassegrain systems. (See Figs. 3 and 4.) The Newtonian secondary is flat,

meaning a spherical surface of infinite radius. When the image field must be flattened, as for almost all photographic applications, optical engineers today tend to favor variations of the Cassegrain form.

The great advantage of all reflecting systems, and the bonus that makes all the difficulties of their image field corrections worthwhile, is the simple fact that mirrors introduce no chromatic errors—all of the wavelengths, or colors of light, are reflected equally. (Please note that this applies only to front-surface mirrors, and that although the geometrical reflection or bending of all wavelengths are equal, the absorption of the surface coating is not.) It was exactly this total elimination of chromatic aberration that led Newton and his contemporaries away from the refractors of Galileo and Kepler, and to the reflecting telescope.

Over the years, many attempts were made to improve the field-, or monochromatic-aberrations of mirror optical systems. (Actually, this is a misnomer because there are no "monochromatic" aberrations. Instead, every aberration exhibits some characteristic of change with different wavelengths of light. But it is a useful way for optical engineers to sort out their individual design problems, and the term is too handy to eschew.)

One such was the concave back-surface mirror, really a lens-and-mirror combination, invented in 1876 by A.F.E. Mangin, a French military engineer. Mangin wanted to increase the light output of searchlights by correcting the spherical aberration of their large-diameter mirrors without resorting to aspherical surfacing. His mirror (see Fig. 9) consisted of a thin negative (divergent) meniscus lens whose back surface was silvered. With this construction he was able to combine the refractive and reflective curvatures so as to eliminate spherical aberration and coma, but only over a small angular field.

The Mangin mirror had a second advantage, of less importance today. In the 19th century, the only good reflective coating was silver, and front-surface silver coatings tarnish rapidly. By back-coating, Mangin was able to sandwich his silver layer between glass on one side and black paint on the other, thus keeping salt air out. This French interest in searchlights for coastal lighthouses also gave us the Fresnel lens, which A.J. Fresnel designed some 60 years previously, for the same purpose. Today's front-surface coatings are vacuum-deposited aluminum, which reflects less light than silver, but doesn't tarnish.

Mangin mirrors are occasionally found within complex mirror-lens systems today, usually as the smaller secondary mirror, and sometimes employing two cemented lenses in order to correct the small amount of chromatic aberration unavoidably introduced by their refraction.

With this clever design, Mangin also introduced the first, and the simplest, of *catadioptric* systems. Previously, optical systems were either *dioptric* (using only refractive lens elements), or *catoptric* (using only reflective mirror surfaces). Now catadioptric imaging systems could combine refraction and reflection to achieve better optical correction.

Please note that these remarks

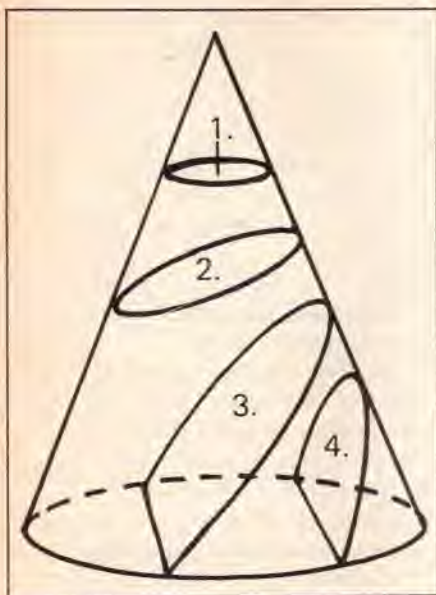


Fig. 5. Conic sections: 1. circle, 2. ellipse, 3. parabola, 4. hyperbola.

right hand and forearm.

Despite his disability, Schmidt became much sought after as a maker of precision astronomical mirrors and lenses. In 1905, he became famous for producing a mirror of 400-mm diameter for the Potsdam Observatory, in the remarkably short period of three months, and this with only one hand. In 1926, he joined the Hamburg Observatory and began a study of wide-field, high-aperture astronomical camera telescopes.

Schmidt knew, as previously mentioned, that when the aperture stop of a spherical mirror is placed at its center of curvature, the system is freed from astigmatism and coma, but still has a lot of spherical aberration. His idea was somehow to combine these good field conditions with the excellent axial image quality of a parabolic surface.

The "basic Schmidt camera"—many

mirror, with a radius of curvature equal to its focal length, the film had to be bent or "sprung" to follow this curve. To dispense with this difficulty, Schmidt later introduced a plano-convex lens, with its flat side facing the flat film plane, as a field-flattener. This was a famous invention of C. Piazzzi-Smyth, the Scottish Astronomer Royal and photographic pioneer, originated in 1874.

How this one-armed *optiker* ground his unique "Schmidt plate" aspherical corrector is a famous example of his optical ingenuity. He started by producing an optical flat, that is, a disk with two perfectly parallel flat surfaces. This workpiece was then placed in a tight-fitting cylindrical holder, which had a heating element to soften the glass slightly, and a strong vacuum pump to make it sag downward. In this bent position, Schmidt repolished the surface flat again, and when the vacuum was released, the disk sprung immediately into the "English bow" profile that he wanted.

Clever indeed! But although Schmidt's corrector was easier to produce than any other aspherical surface, it was still too complex for anything but hand-made, one-of-a-kind fabrication. As far as the earth-bound image-maker was concerned, the score stood Astronomy 2, Photography 0. Mangin's mirror wasn't enough, and Schmidt's corrector was too much.

What the world wanted was an optical five-cent cigar, an all-spherical long-focus system that would provide correction similar to that of the Schmidt camera. People who've never worked in an optical factory are always more enthusiastic about aspherics than those who have, and the rule stands: think three times before specifying an aspherical surface. Spherical surfaces express the way in which the machinery works; they're the easiest of all surfaces to produce, and to test.

War, or the threat of war, has a way of accelerating technical progress, regardless of other costs. And, as the great powers aligned themselves for the 1939-1945 unpleasantness, increasing the demand for long-focus optical systems, a new sort of spherical corrector for spherical mirrors was invented. Invented in fact almost everywhere, and almost simultaneously.

This new sort of concentric catadioptric corrector (see Fig. 11) was invented independently between 1940

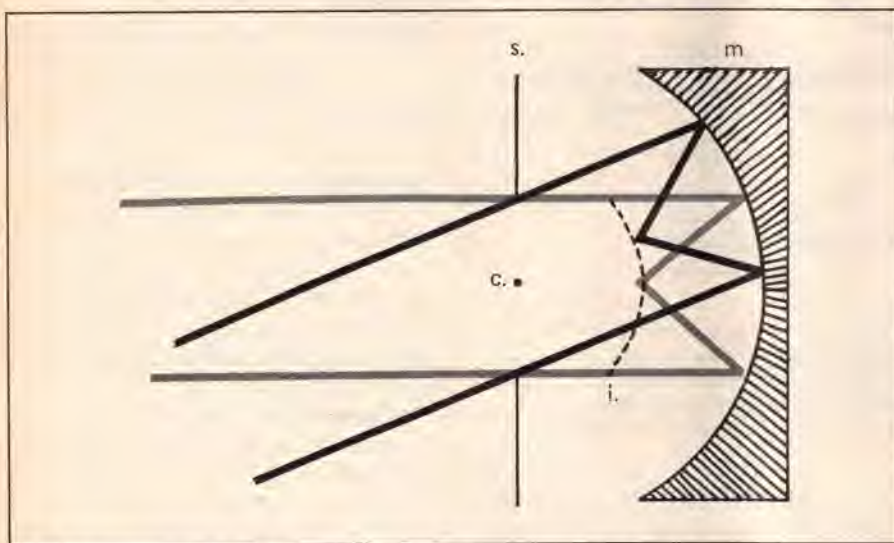


Fig. 6. If aperture stop (s) is placed in center of curvature (c) of spherical mirror (m), image is free of coma, astigmatism, and is formed on spherical image surface (i).

concern the formation of real optical images, and not their delivery to the eye as virtual images by means of additional refractive lenses. Even the earliest catoptrical systems of Newton, Gregory, and Cassegrain used one or more lenses in their eyepieces.

Another strong catadioptrical attack upon these problems was made in 1930 when Bernhard Schmidt (1879-1935) originated his famous astronomical "Schmidt camera." Schmidt was a strange, morose genius who began his optical career as a boy, making a convex lens by grinding the bottom of a bottle in a saucer filled with fine sand. He almost ended it with a too-successful gunpowder experiment that cost him his

variations and improvements were to follow—consisted of a concave spherical mirror in front of which is a thin corrector plate of unique aspherical design, placed at the center of curvature. This stop position eliminated astigmatism, coma, and distortion, leaving only spherical aberration, which was corrected by the aspherical corrector plate (Fig. 10), and uncorrected field curvature. His first (1930) system had a mirror of 440-mm diameter, a corrector of 360-mm diameter, and operated at a relative aperture of $f/1.7$. Later versions were to reach and even exceed $f/1$.

Because of the uncorrected field curvature, the image being convex to the

and 1943 by D.D. Maksutov, U.S.S.R.; A. Bouwers, Holland; D. Gabor (of holographic fame), Great Britain; J.G. Baker, U.S.A.; M. Paul, France; J. Picht and K. Penning, Germany; and others. But Maksutov published first, so his name is almost always used to describe the type.

"Almost always," because A. Bouwers of the Oude Delft optical company in Holland was the first actually to market lenses of this type for civilians, and because of a wonderful book he wrote called *Achievements in Optics*. This English-language work details Dutch optical research during their five years of wartime occupation. It was published immediately after the war, but is more generally found in a 1950 photo-offset reprint published by the international Elsevier Publishing Company. Most libraries have this edition, and it's well worth delving into.

As one can see from the drawings in Fig. 11, placing the Maksutov/Bouwers corrector with its concave side toward the incident light gives a shorter but somewhat fatter package. Reversed, it

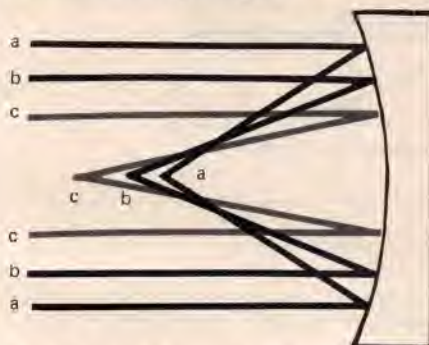


Fig. 7. Spherical aberration of a concave spherical mirror is much like that of a lens: rays reflected from outer edges of the mirror come to a closer focus than those more centrally reflected. Because spherical mirrors require far less curvature than lenses of equal focus, the mirror's spherical aberration is much less than that of a single lens element.

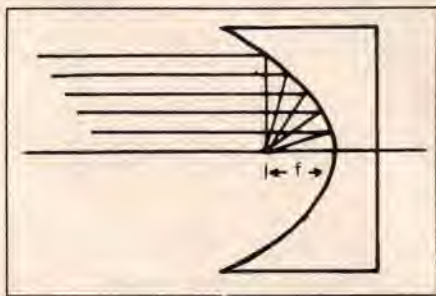


Fig. 8. A parabolic mirror is free from spherical aberration. Rays striking the concave surface at all distances from the optical axis are brought to a common focus.

can provide even better optical correction, but the extended tube length is usually considered self-defeating, except for occasional non-photographic applications.

Two Maksutov-Bouwers correctors can be combined (See Fig. 12) as was done by Carl Zeiss, Oberkochen, in their 500- and 1,000-mm Mirotar systems, and a great many design variations are both possible and extant. One of the more radical of these is the 600-mm "Solid Cat" of Perkin-Elmer, now being produced in the Vivitar Series 1 (see Fig. 13).

In its simplest, one-piece, air-spaced form, the Maksutov-Bouwers corrector is really a conceptual extension of the Mangin mirror, affording additional degrees of freedom to achieve higher orders of correction. Combined with a spherical main mirror in Cassegrain configuration (see Fig. 14) it yields very good, uniform image quality over the whole field of view, providing that two problems are dealt with adequately.

The first of these is field curvature, the lack of a flat image plane. This can be corrected either by the curvature of the secondary mirror, or by means of a multi-element relay lens placed between the secondary mirror and the final image. These two variables can also be made to work together very effectively for this purpose. On the 24x36-mm film format, good field flatness is obtained over diagonal angles of as much as about five degrees, sufficient for catadioptrical systems with a focus of 500-mm, or more.

The other snag is a slight amount of chromatic aberration introduced by the initial refraction, as the rays penetrate the front-positioned Maksutov-Bouwers corrector element. This is an inevitable consequence of any catadioptrical construction combining refraction with reflection. The amount of this induced chromatism is quite small, and hardly noticeable unless the system operates at a very high f-stop. (This is because the principal chromatic error takes the form of "spherochromatism," or "Gauss error," which is a chromatic variation of spherical aberration.)

Happily, this is easy to correct, and in respect to chromatic aberrations, catadioptrical mirror-lenses are generally superior to purely refractive lens systems. Again, this necessary correction is usually achieved by introducing successive chromatic over- and under-correction in the refractive

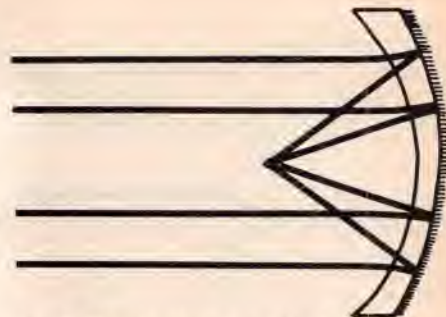


Fig. 9. Mangin mirror is a thin divergent meniscus lens whose back surface is silvered. Divergence caused by negative first surface cures spherical aberration of the concave spherical back surface.

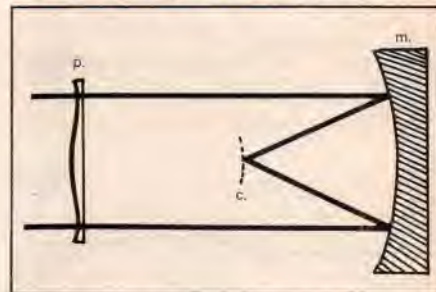


Fig. 10. Basic Schmidt high-aperture system uses concave spherical mirror (m) and aspherical "Schmidt corrector" plate (p) placed at center of mirror curvature. Image is free from spherical aberration, coma, and astigmatism, but is formed along curved image surface (c).

relay lens. Sometimes, as in the case of the 1,000-mm Nikkor (Fig. 15), a Mangin type secondary mirror can help, and the Maksutov-Bouwers corrector can itself be achromatized as a two-glass cemented doublet (Fig. 16).

We have now come full circle, from the primitive but ingenious mirror-cameras of Wolcott and Draper, to the modern "cat" immortalized in Lief Ericksen's amusing limerick. Now begins the controversy. How good are mirror-lens systems? What are their inherent advantages and disadvantages? How do they stack up against good, conventional refractive lenses? Ignoring all of their scientific, astronomical, electronic-TV, military, and aerospace applications, how do the big cats bite as practical picture producers?

Above all else, catadioptrical mirror-lens systems provide near-perfect chromatic and excellent field corrections, in the shortest and handiest of all possible packages. Overall lengths, from front corrector lens to image plane, when focused for infinity, can amount to as little as 20 or 25 percent of the effective focal length.

But against this, they must be debited

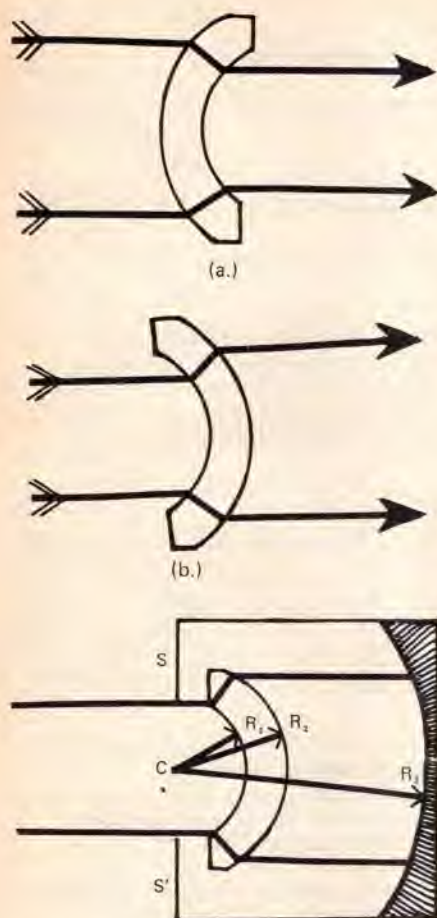


Fig. 11. The Maksutov-Bouwers corrector is a thick concentric meniscus lens. Placed convex to the incident rays (a), the beam is narrowed, but the system is lengthened. Placing concave to the incoming rays (b) makes for a fatter but shorter final package. The Maksutov-Bouwers system is concentric, the three spherical surfaces sharing a common center of curvature at C, also the position for the aperture stop.

for low optical contrast. As shown in Fig. 17, very tight internal baffling is required to prevent rays not reflected by the main mirror from passing directly through the system and degrading the image. In addition to these so-called "skew" rays, any dust or grease on either of the mirrors will tend to diffuse their reflections.

Every mirror lens should be provided with an adequately deep lens shade, whose importance is far greater than with ordinary refractors (whose long tubes blot up skew rays). The best pattern, in my view, is an integral sliding tube that pulls out to protect, and retracts for traveling.

As a matter of more than incidental importance, it's worth remembering that most long-lens work is done on high-speed black-and-white and color films,

which lack the inherent contrast and haze-cutting brilliance of slower materials.

Image contrast is actually the *second* fundamental problem in mirror-lens and telephotography.

The *first* problem is camera and subject movement, and the only answers are firm support and fast shutter speeds. Thus, I for one do not count the lack of an adjustable iris diaphragm to regulate depth of field as too great a disadvantage of the mirror lens. In practice—especially as one gains experience—it's best to stay with the top f-stops anyway, in order to use the shortest possible exposure times.

Theoretically, and for many special technical purposes, mirror-lens systems

can be extremely fast, and some have actually approached $f/1$. But in terms of lenses now being marketed for 35-mm SLRs, their rated f-stops are at best only slightly better than the fastest comparable refractors. Lens diameters and weights rise even more staggeringly with larger mirror-lens apertures than with conventional optics.

Mirror-lens apertures, even when accurately rated, don't transmit quite as much effective illumination as refractors of the same focus working at equal f-stops. Each of the two aluminized mirror surfaces introduces a loss of at least 12 percent, giving a compounded minimum loss of about 23 percent, the price that must be paid for a conveniently folded ray path.

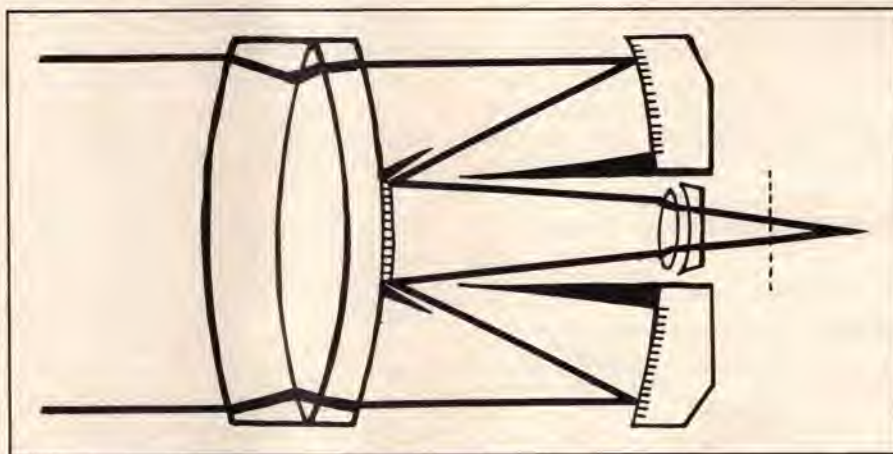


Fig. 12. Carl Zeiss 1,000-mm Mirotar $f/5.6$ uses two Maksutov-Bouwers front correctors. Sealed system (see text) makes for particularly effective internal baffling. Lens covers 24x36 mm with 2.5-degree field, and 6x6 cm (on Rollei SL66 camera) with 4.5-degree diagonal field. Dotted line at rear of system indicates filter position.

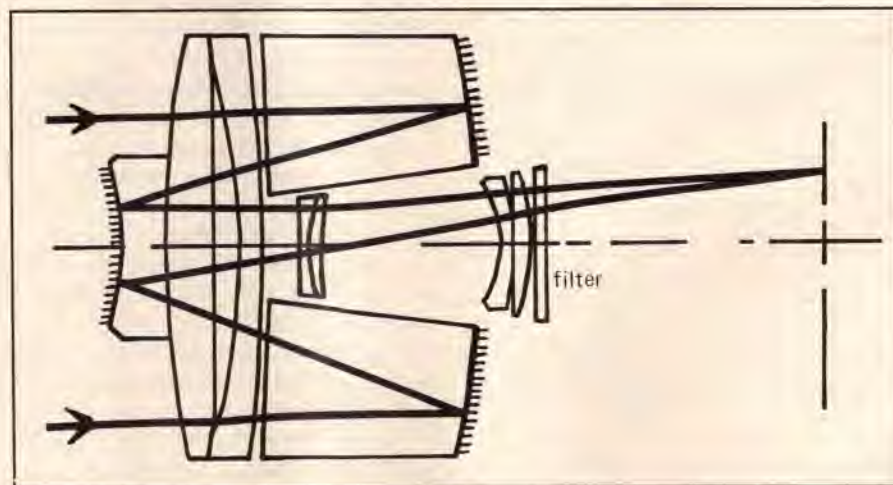


Fig. 13. Vivitar's 600-mm $f/8$ "Solid catadioptric" lens keeps its ray path almost completely in glass, and is the most compact of all mirror-lens systems. It is also one of the most complex, using two Maksutov-Bouwers correctors, with two Mangin mirrors, the very thick main mirror, and the externally cemented secondary mirror. More than this, the two Maksutov-Bouwers correctors are used twice, for both legs of the folded ray-path.

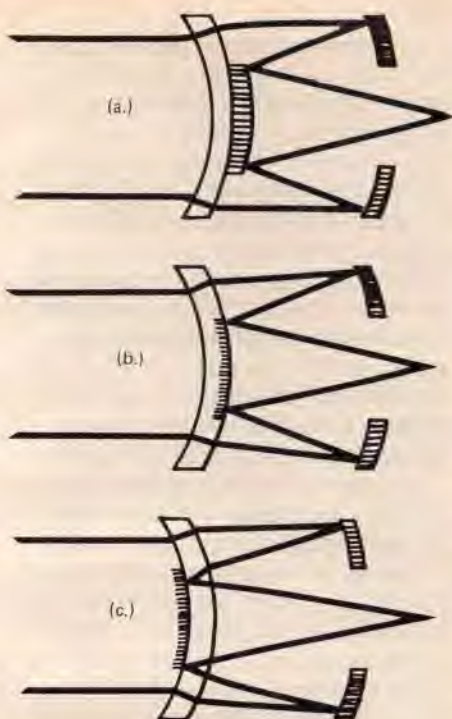


Fig. 14. Three typical Cassegrain-form catadioptric systems using the Maksutov-Bouwers corrector concave to the incident light in order to obtain the shortest possible tube length. Auxiliary refractive lenses have been omitted. In (a) the secondary mirror is a separate piece cemented to the back of the corrector in order to introduce a different center of curvature. The secondary mirror is coated directly onto the rear surface of the corrector in (b), and onto the front surface in (c). These systems are completely concentric. Note that in (c), the secondary mirror is actually a Mangin type, since the rays must be refracted by the glass of the corrector before they are reflected.

Some years ago I measured the relative transmission of three 500-mm systems, a simple two-glass cemented achromat, a complex telephoto, and a mirror lens. The achromat, with only two air-glass surfaces, proved nearly a stop faster than the tele-lens, and almost a stop and a half faster than the catadioptrical system. This should not be taken as necessarily typical, but it does point to the kind of transmission differences that can be expected.

It is also worth noting that the depth of field provided by a mirror lens is somewhat less than that of a conventional refractor of the same focus working at the same marked f-stop. This is because the opaque central disk of the catadioptrical secondary mirror uses up an amount of aperture area that must be compensated by a larger diameter.

SUMMER 1977

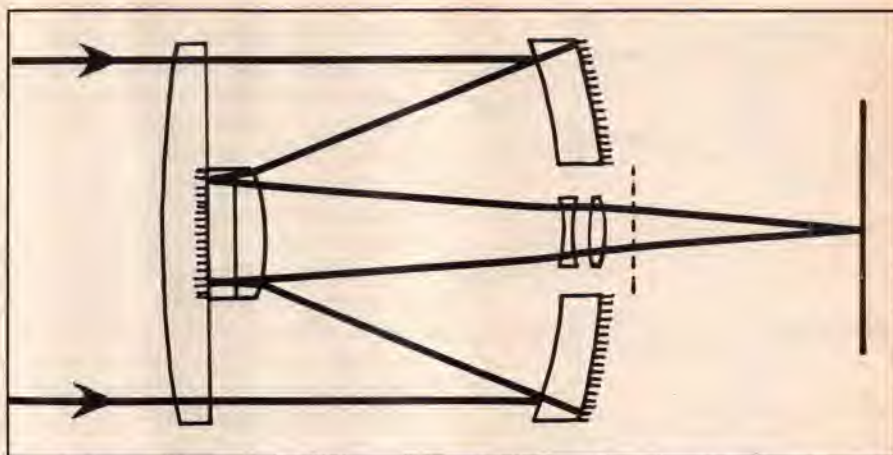


Fig. 15. 1,000-mm Reflex-Nikkor f/11 uses Mangin mirror as main mirror and two-element secondary mirror. Front corrector is almost flat, with very little convex front curvature and flat back surface. When focused to infinity, distance from first vertex to image plane is only 265-mm, just a bit more than a quarter of its focal length.

Depth of field is governed by ray geometry, and the steeper the limiting ray angle for a given aperture, the less the depth. Mirror lenses require slightly steeper limiting ray angles for any given f-stop value, and the depth of field they provide is approximately equivalent to that of a refractor with an aperture about a half stop faster. In a typical case, I was once able to determine that a mirror lens operating at f/5 gave depth of field equivalent to f/4.3.

Aside from their inherently lower image contrast, and the light consumed by their double reflections, a serious drawback of catadioptrical systems arranged in Cassegrain style is the strange, doughnut-shaped out-of-focus effect that they produce. This is explained by Fig. 18, which shows that a

mirror lens can produce a solid image point only in its plane of best focus.

These doughnuts become troublesome when the picture contains out-of-focus foreground and/or background areas, and only when the pictorial effect of these annular rings becomes visually disturbing. This is most likely to occur when the defocused areas contain many individual points of light, or a lot of fairly small reflective objects.

Two examples that come to mind from my own catadioptrical misfortunes are a backlit picture of a sailboat in twilight, floating in a lake of shimmering doughnuts, and coverage of a tennis match in which these peculiar rings smothered the spectators.

Mirror lenses yield their finest imagery in long-distance shots without anything in front of, or behind the subject. A bird, or an aircraft isolated in space will be recorded beautifully. But distant mountains or nearby trees may ruin the effect because of those visually disturbing rings of light. From a purely pictorial point of view, the catadioptrical system is excellent for isolating distant objects in space, but not so good for relating these objects to their surroundings.

The great physical attraction of the mirror lens is its very short tube length, which makes the tracking of moving subjects a lot easier, and which enables a lot more free-hand shooting than is generally possible with big refractors. The other side of the coin is the mirror lens's wider diameter, which make for packing and carrying difficulties.

Another widely admired mirror-lens characteristic is the faster focusing that



Fig. 16. Some optically elegant Maksutov-Bouwers correctors are achromatized by combining two glasses having different indexes of refraction and degrees of color dispersion. This corrects the small amount of chromatic aberration introduced by refraction of rays by corrector lens.

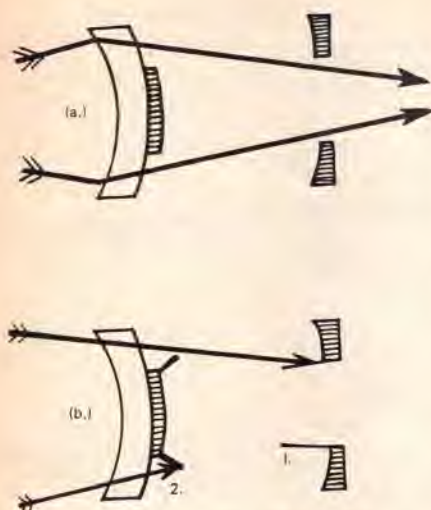


Fig. 17. The un baffled mirror lens (a) permits unwanted skew rays to penetrate the system without reflection by the main mirror, thereby degrading the image. The lens (b) has baffles at (1.) and (2.) to prevent this.

most of these systems offer, although this involves a technical tradeoff that is seldom considered. When you focus by moving the whole lens, which is the case for all long-focus and telephoto refractors, and for a small group of mirror lenses, the amount of lens movement is related to the square of the focal length. Changing the focus from one distance to another will require 25 times more lens movement for a 500-mm lens than for a 100-mm optic. Getting from here to there on the lens barrel involves a lot more turning and twisting.

Most mirror lenses today achieve sensationally fast focusing by moving internal elements, usually either the main or secondary mirror. In so doing, however, they reduce the effectiveness of their internal baffling, which, quite obviously, can't always be in the right place at the right time.

From a purely optical point of view, the best system is one with permanently sealed optics that can't be moved, and perfectly positioned tubular baffles to block skew rays. Mirror lenses of this type focus by moving the camera, either by means of an intermediate bellows or via an extra-large helicoid focusing mount to which the camera is attached. Such lenses tend to give better performance, but they're not liked very much by the majority of photographers who value the fast handling of internal optical movement more than the last whit of optical quality. So you pay yer money and makes yer cherce.

Another reason why I personally prefer the slower-focusing sort of cat with a sealed optical system is that it usually means a more rugged lens, with better optical centering. By definition, all of the optical elements should be perfectly centered around the optical axis of the system, whether these are lenses, mirrors or both. When these elements move internally, their centering can become questionable, because most catadioptric systems are mounted in very thin tubes. Often, perfect initial centration will suffer from the joltings and jarrings to which all lenses are subject.

In my experience, a great many mirror lenses, particularly used ones, lack good centration. This can be tested by mounting the lens on a tripod, focusing on a stationary object, and racking the lens in and out of focus as rapidly as possible. If the object seems to "swim" in some circular or elliptical pattern on the groundglass, it is poorly centered, and this will certainly cause a lack of image sharpness.

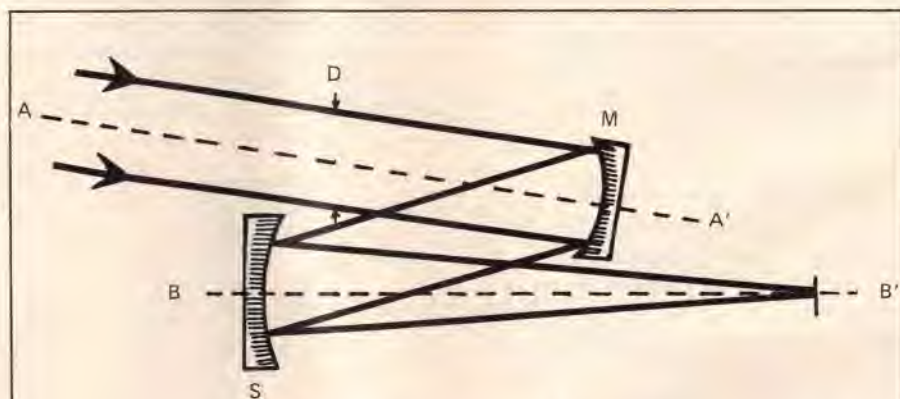
Sometimes, centration error can be detected by the shapes of the out-of-focus annular rings. These should be perfectly round, right across the film format. When they're not, and off-axis doughnuts appear squashed in one direction, this may indicate bad centration. In a very few cases, this can

mean poor optical correction.

Because concave mirrors require only very slight curvatures to achieve the amount of ray-bending needed, they are very much more sensitive to temperature variations than the general run of conventional refractors. [The exception to this is the new family of refractive lenses using fluorite elements to obtain particularly excellent chromatic correction. The fluorite (CaF_2) elements are extremely sensitive to temperature variations.] For this reason, some mirror lenses do not have a firm infinity block position, and will actually focus in past infinity, as do all fluorite refractors.

It is often argued that heat and cold will affect the focal length of the system, but not the optical correction. This may be true in some cases, particularly when the design is simple, but I doubt me that it's always so. To combat these effects, some makers coat their lens barrels with highly reflective white (or off-white) paint, and others use a combination of metals selected for their different coefficients of expansion. White paint keeps the lens cooler, and special alloys tend to push against each other isometrically when things become too hot or too cold. These problems occur with long-focus refractors as well, but mirror lenses tend to suffer more.

Mirror lenses are very much a part of the optical scene today, and play an



The secret of the Goema Katoptar?

Unlike other mirror-lens systems, the 500-mm Katoptar f/8 has a conventional iris diaphragm that stops down to f/45, making it the only catadioptric system to permit depth-of-field control. Ordinarily, this is impossible because in a uniaxial system, any internal stop will vignette at the annular main mirror, and might even interfere with rays being reflected toward the secondary mirror. But, if the mirror system is biaxial, as above, an aperture stop can readily be located at the center of curvature of the main mirror. Here, the axis of the main mirror, AA', is slightly tilted in relation to the axis of the secondary mirror BB'. When the Katoptar is used, the photographer must point it about 20 degrees down from the point actually being aimed at. With the viewfinder of an SLR, this is easier than it sounds, although it does take some getting used to. Note that for simplicity, we've drawn only the two essential mirrors, eliminating all of the lens's correctional optics.

Using Behind-the-Lens Filters

Most, if not all modern mirror lenses make some provision for behind-the-lens filters. One form is an internal disk that is rotated to position one of four or more filters, another is a filter slot permitting the insertion of small-diameter filters as needed. The built-in disks usually include a number of neutral-density filters as a means for reducing exposure, although this is seldom a good idea—using a higher shutter speed (if available) is almost always preferable.

The important thing to note is that all focusing must be done through the filter that will be used, or through a clear glass equivalent, such as an ultraviolet absorbing filter.

"Equivalent" here means a filter of the same glass, and the same thickness. The reason for this is that a filter causes a shift of focus caused by the refractive index of the glass, and its thickness.

A typical filter glass with a refractive index of 1.5 or thereabouts will cause a shift in focus of about one-third the filter thickness. This means a one-millimeter shift with a three-millimeter filter, well beyond the depth of focus (depth in the image space) of any lens aperture greater than $f/32$. If one focuses without any filter behind the lens, introducing the filter afterward will throw the picture completely out of focus.

important role in many forms of long-range picture-making with focal lengths from 500- to over 1,000-mm. Excellent as they may be, however, the big cats are specialist optics whose all-around usefulness is marred by the inherent weaknesses I've tried to explain. In a sense, mirror optics are like ultra-wide-angle and fish-eye lenses: they're not for everyday use, but when they're needed they're very useful. 

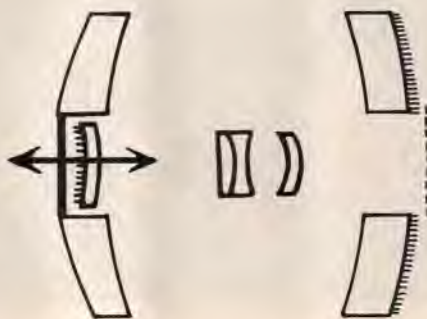


Fig. 19. 800-mm Minolta Rokkor-X system uses Mangin-type main mirror. Exceptionally fast focusing (down to 26 ft) is achieved by moving the small secondary mirror. This schematic drawing does not show the two tubular baffles attached to both mirrors to block stray light.

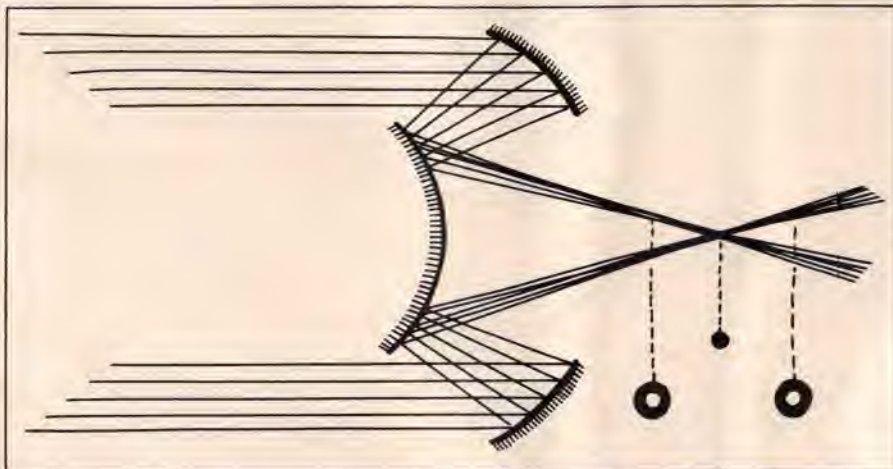


Fig. 18. The primary and secondary mirrors of a catadioptrical system transmit a hollow beam of light because of the central opacity of the secondary mirror. Only in the plane of best focus is a solid blur-circle of light formed. Out-of-focus image points are recorded as annular rings, or "doughnuts."



DORCHESTER DAYS

Photographs by Eugene Richards

By DOROTHEA LYNCH

Past massive storefront gratings, twigs protecting Dudley Street's shops and dank bars, upstairs to an apartment rank with weeks of winter cooking—odors of plantain, saffron and passionfruit. A steamy bathroom strewn with Pampers and moist towels.

The husband put down his beer and moved from the TV, resenting this intrusion by the photographer. Alone in the room with Gene, Lucy mournfully lifted her blouse to show breasts swollen by her newest pregnancy.

Over morning coffee, Gene tells his girlfriend of yesterday's encounter and of the strain of trying to make intimate photographs.

Dorrie is unsympathetic. She teases him about the prettiness of the Puerto Rican women that he photographs, the vulnerability of their faces.

Gene sighs and looks out the window. Bright blue sky. It is not one of the mornings when it will be hard to get going: a morning that is too cold or rainy, a morning when he is bored with Dorchester or without film, without hope of finding a publisher for his new pictures.

Bright blue sky. It reminds him of mornings in Arkansas where he had worked as a social worker and newspaper reporter. He speaks well of his years in the black













South, in the same way that an orphaned child recalls his natural family—the hard realities softened by homesickness. Stretched out on the porches of shacks at Round Tree or Doe Lake Plantations. Rarely did he question the purpose of his photographs or feel awkward when he did use a camera.

Gene does pushups and lifts 130 pounds of iron weights over his head; his arms tremble at each push. He has always wanted to be strong. Thirty-two years old now.

Sun and wind and the restricted view through the camera are deepening the wrinkles at the corners of his eyes. His hairline is creeping back across his head. At least it would be nice to have a car that was paid for. Not just two beat-up Nikons and 60 photographs of Dorchester. He isn't complaining. In 1973, a book of his Arkansas photographs was published [*Few Comforts or Surprises: The Arkansas Delta*, M.I.T. Press, Cambridge, Mass.] and he earns a small income from teaching and freelancing.

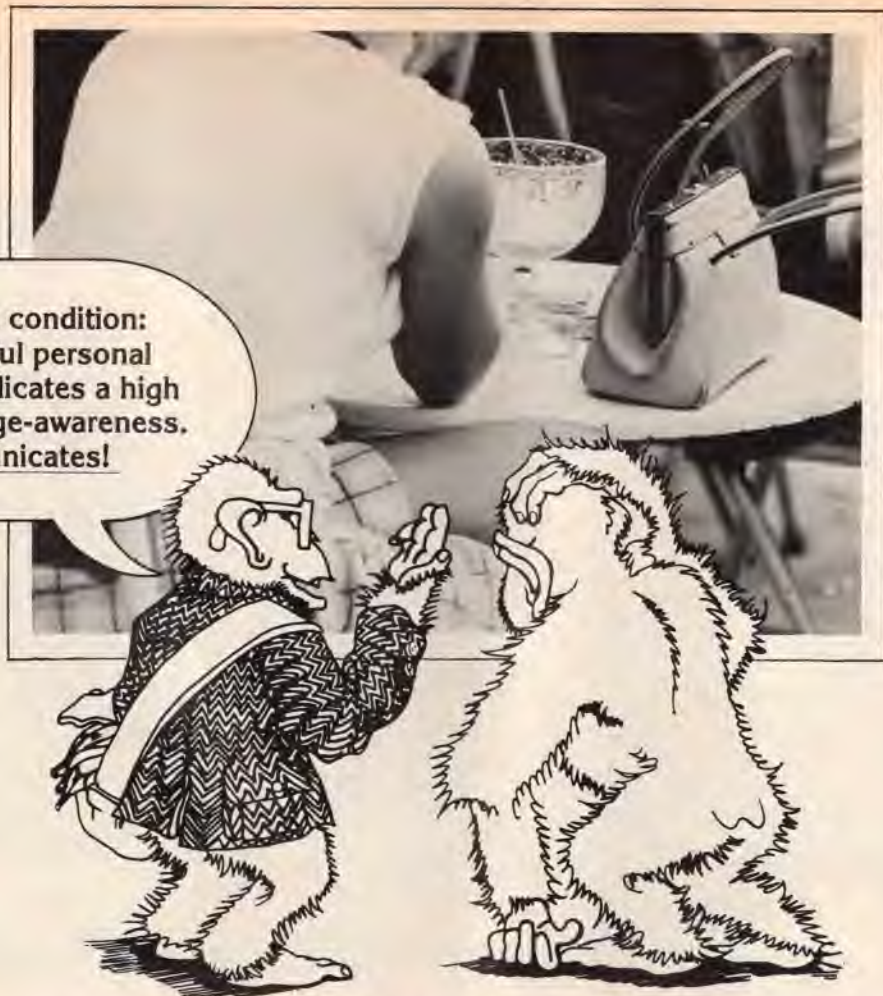
Gene packs a Nikon and three lenses into a vinyl bag and leaves the apartment with no real idea as to where he is going.

Outside Manny's bar, silent young men with afros and velour caps

continued on page 115



The human condition:
This powerful personal
statement indicates a high
degree of image-awareness.
It communicates!



Drawing by Andrew Longo

Becoming a photographic critic is not at all difficult. In fact, it is extremely simple, since you need to know only a bare minimum about either photography or criticism.

What is required, however, is a smattering of psychology and more than a smidgeon of skill in making profound statements. To begin with, it should be understood that the old-time critic, who rhapsodized over an s-curve or lovingly discoursed about Dynamic Symmetry, is as extinct as . . . well, the extinction-type of exposure meter that was popular a couple of decades ago. Anyway, one doesn't often discuss the content of a photograph nowadays. When criticizing a picture, you tell not what you see in it, but rather how you feel about it. (Or, possibly, how you think the photographer felt about it.)

For example, if the photograph under discussion shows a loaf of bread and a jug of wine, don't be sidetracked into criticizing the composition or the lighting. *The picture either makes you hungry and*

The author, who in his more logical moments is a critic for POPULAR PHOTOGRAPHY, attempts not to practice what he preaches in this article.

ANYBODY CAN BE A CRITIC

BY HARVEY V. FONDILLER

thirsty, or it doesn't! On the other hand, it might indicate that the photographer was obsessed with food, not having had a square meal in days. Take your choice!

With the help of a few high-sounding phrases, you can easily pass judgment on any photograph or photographer. To show how this is done, we present a ready-made interview that can be used in practically any situation when you are asked for your critical opinion.

Q. Could you tell me, sir, your reaction to these photographs?

A. Surely. Some of these pictures are superb. They have songs to sing and they convey a message about the human condition.

Q. How about the others?

A. They evidence mediocrity.

Q. What kind of mediocrity?

A. Heroic mediocrity.

Q. What do you think of the photographer's vision?

A. It's positively eye-opening, though sometimes it can be astigmatic, blurred, and faulty.

Q. And how about his treatment of the image?

A. Broadly speaking, the photographs exemplify the renaissance of image as image.

Q. Which is to say that . . .

A. . . . that they show a high degree of image-awareness.

Q. I see. What do the pictures project?

A. Excitement and buoyancy, to say the least.

Q. Do you think any of the pictures are memorable?

A. Many of them resemble the after-images of memory. But on the other hand, some are derivative. They echo the efforts of other photographers. They present compositional clichés. Their approach is pictorially hackneyed.

Q. What qualities does the photographer reveal in his better pictures?

A. A sense of astonishment vis-à-vis the visual world; intuitive judgment and the confidence to follow it no matter

where it leads.

Q. No matter where . . . ?

A. Absolutely. That is because he has not only sight but insight. He has sensitivity and the artistry to create powerful personal statements.

Q. What is his statement in this picture of a soldier sitting in a railroad waiting room?

A. I'm glad you mentioned that. You'll notice that the soldier does not carry a gun. This is an anomalous situation—an inherent contradiction of the word "soldier." The photograph, therefore, suggests Hemingway's famed novel, *A Farewell to Arms* (*Arms* . . . get it? This soldier doesn't even carry sidearms.) Perhaps he's waiting for someone. If the viewer's orientation is socio-economic, maybe he's *Waiting for Lefty*. If the viewer's philosophy is existentialist, the subject is *Waiting for Godot*. You see what a complex statement the photographer has made in this apparently simple picture?

Q. Er . . . yes. Is that what is meant by the inner meaning of outward reality?

**Woman in white:
Interesting as a
monochromatic mystery,
but projecting the resonance
of a compositional cliché.**



**Experiment in time:
Old and new...this fourth-
dimensional visual pun boggles
ratiocination, spurs
strabismic seeing.**

A. Precisely. Now that you comprehend this concept, isn't the picture marvelously *communicative*?

Q. I suppose it is. I just wish the soldier was in better focus. Tell me, do any of these pictures *fail* to communicate?

A. Occasionally . . . when the photographer strays from the path of esthetic beauty . . . when he discards his self-created mystique. . . .

Q. What kind of reality does he recognize?

A. Inner and outer. That is to say, real and *unreal* reality.

Q. I see. What does he do with reality?

A. He transcends it. He presents us with metaphorical slices of life. See this picture of a puddle? It isn't simply a puddle. It represents everything liquid, from a dewdrop to an ocean. Get what I mean?

Q. . . .

A. Regardless of the photographer's subject, it must first exist in his mind. Otherwise he wouldn't be able to focus on it.

Q. Oh.

A. Here's how this thing operates. The photographer's conscious self tries to express one thing, but his unconscious self strives to express something else—something that resists being seen. See?

Q. Yes, of course.

A. That's why this photographer always avoids *The Decisive Moment*. Have you noticed how many of his pictures capture *The Inauspicious Moment*?

Q. Now that you mention it. . . .

A. Don't you see—he *invariably* makes his exposure in a totally *insignificant moment*. That's what makes it so important!

Q. I'm not sure I follow you.

A. It's really quite simple. Observe this picture of a vagrant sitting on a park bench, not doing anything. The fact that the subject is insignificant helps to make the photograph significant. The photographer *reveals by concealing*. He *conceals by revealing*. Understand?

Q. Perhaps you can explain. . . .

A. Summing up, it is my considered opinion that the photographer has successfully dealt with serious problems confronting art in our time. This exhibition is among the most important of the year, if not the decade—and in this judgment, mind you, I have not overlooked Steichen's *The Family of Man*.

Q. And your reasons for according this high praise?

A. Mainly because the images are distinguished, even when they are barely distinguishable. Observe, for example, this photograph, a completely black area.

Q. It looks as though the negative was accidentally placed in the fixer before it was developed. . . .

A. Quite possible. At any rate, *the results justify the means*. The photographer has succeeded in getting an image of uniform, maximum density—a totality of black. He has used a profound knowledge of light and its action on silver salts to create, in his

continued on page 112

WHAT YOU SEE IS NOT WHAT YOU GET



Your SLR viewfinder may not
be telling the whole story

By ROBERT MARTIN

So you just bought a brand new bellows, a slide copying attachment, and 100 feet of Ektachrome Slide Duplicating Film 5038. Now you're about to start making your own duplicate slides. Good luck, fella!

You'll need the luck because regardless of everything you've ever heard about the 35-mm SLR's almost magical ability to let you see what you are about to record on film, I'm here to tell you that there isn't a single such camera manufactured today that will let you see *everything* you are going to shoot. And if you can't see everything beforehand that is going to show up in your duplicate slides, chances are pretty good that you will have some surprises when you look over your first batch.

But don't stop reading here if you're not into slide copying, because this peculiar characteristic, shared by all contemporary 35-mm SLRs, is probably going to affect you even if you don't use a bellows or a macro lens. You may find more in your images than you bargained for, even when using nothing more exotic than a standard 50-mm lens attached to your Supersnapperflex.

When you look into that little window at the rear of an SLR pentaprism, you actually do get to look right through whatever lens, or lenses, or combination of optical devices that happens to be mounted on the camera body. But what you see is not exactly what the film gets to see. And therein lies the rub. What you do see in the average 35-mm SLR's viewfinder window is only about 85% of the image you will record on film. The average viewfinder system lets you see about 92% of both the horizontal and the vertical dimensions of that image. In case you're wondering about what an "average" camera is, it was arrived at by physically measuring the viewfinder performance of the first 48 35-mm SLRs I could lay my hands on—cheap ones, middle-priced ones, expensive ones, and outrageously expensive ones.

All those numbers are fine, but they probably really don't mean much to you without some frame of reference. The best such frame I can think of is the cardboard one that Kodak puts around each of the images they process on their various chromes. Kodak's published dimensions for the opening (on the emulsion side—the opening on the film-base side is bigger) in a 2x2-inch cardboard slide mount are 22.9x34.2-mm, or about 91% of the nominal 24x36-mm dimensions of a full-frame 35-mm SLR image. If you multiply each of those nominal full-frame image

35-MM PHOTOGRAPHY

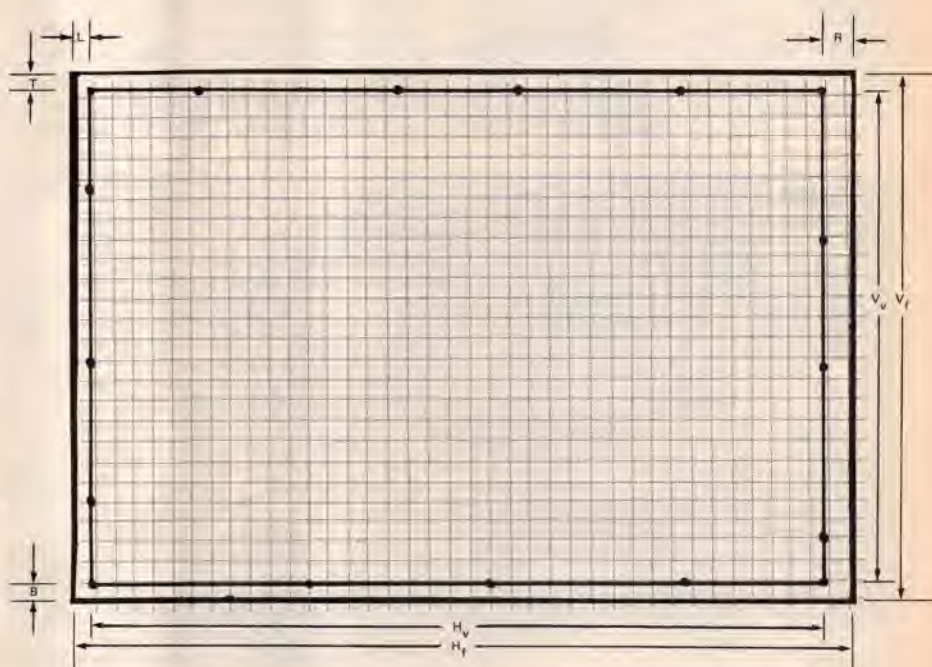
dimensions by the 0.92 the average viewfinder lets you look at, you come up with 22.08x33.12-mm. Surprise! It seems that the average camera manufacturer has decided that all any photographer needs to look at is about 85% of the total image area, or approximately 6% less than Kodak allows you to see in one of their cardboard slide mounts. In my humble opinion, that is a classic example of wrongheadedness if there ever was one. (And come to think of it, wouldn't it be nice if Kodak offered us a 100%-of-the-frame slide-mount option?)

Since I opened this article by wishing luck to the photographer who wants to copy slides with an SLR, let's see exactly why luck will be necessary to do the job. The first thing the critical photographer will have to decide, before beginning the slide-duping process, is whether he or she agrees with the film processor (most independent film processors and most film producer's labs use slide mounts with about the same opening dimensions as those found in the Kodak cardboard mounts) that 9% of the image you shot was totally unimportant and should be cropped. Unfortunately, since the processor has already cropped it for you, you will have to remove the slide from its mount to be able to make this decision. For the sake of expediency, let's assume that you are happy with the processor's cropping and don't want to bother removing the film frame from the mount—you'll settle for an exact duplicate of the image you see within the mount's opening. To get it, you might think that all you'll need to do is to slip the mounted slide into your slide-copying attachment (or put it on your light box or other slide-copying device), extend your bellows to the dimension required with the particular lens you are using to get a reproduction ratio of 1:1 (or use tubes or some other optical device to get the same ratio), adjust the lens-to-subject distance to get critically sharp focus, accurately center the image in the viewfinder, determine the exposure, and shoot. No way! It just doesn't work out like that at all.

If your lens and bellows are accurately set to provide you with a 1:1 reproduction ratio, the image you see in an average viewfinder may very nearly coincide with the image within the slide mount, but the image you record on film will include a border (most likely all around it, but very possibly only on two sides), formed by the portion of the cardboard slide mount that you can't see in the viewfinder. This might not seem



To determine how much your SLR's viewfinder lets you see of the images you make, begin by mounting camera on copy stand (or tripod). Focus on a clean sheet of graph paper and use a marking pen to make row of dots indicating the extreme borders of scene you see in viewfinder window (left). Join dots with pen to make a rectangle (right).



After photographing the rectangle you created top right, souping the film, and making a print, you should have an image like this. To determine the percentage of horizontal clipping (H_c), divide the distance between the two vertical sides of the rectangle you've drawn (H_v) by the distance between the vertical edges of the image (H_f) and multiply the number so obtained by 100 ($H_c = H_v \div H_f \times 100$). To find the percentage of the vertical dimension of the image that your viewfinder clips (V_c), divide the distance between the horizontal edges of the rectangle you've drawn (V_v) by the distance between the horizontal edges of the image (V_f) and multiply the number obtained by 100 ($V_c = V_v \div V_f \times 100$). To find the percentage of the image area (A_v) that your viewfinder allows your eye to see, simply multiply H_c by V_c and divide the product by 100 ($A_v = H_c \times V_c \div 100$). To learn whether your viewfinder clips asymmetrically, determine whether the distance between the vertical edges of the rectangle and the vertical edges of the image (L and R) are equal, and whether the distances between the top and bottom edges of the rectangle and the top and bottom edges of the image (T and B) are equal. If either or both of these dimensions are unequal, your viewfinder is giving you an asymmetrical view of whatever you shoot. My own test shot above revealed that the viewfinder clipped 5% of both the horizontal and the vertical image dimensions ($H_c = V_c = 95\%$) and allowed me to see 90% of the image area. It also showed that the view available was slightly asymmetrical. Since T is slightly greater than B , and R exceeds L , the test indicated that the viewing screen showed me more of the bottom and the left side of what I was photographing than it did of the top and right sides of it. Be very sure, when making this check, that the camera does not move between the time you check the rectangle in the viewfinder window and the time you shoot.



You can also get an actual, visual preview of what your test shot of your viewfinder-image rectangle (see previous page) will look like by opening the camera back (with camera unloaded, of course) and placing piece of groundglass over inner film rails. Then set shutter speed on B (bulb) and use locking cable release to hold shutter curtains open so that image, focused on groundglass, is visible. My simple setup, left, was used to make image above, which is the same one that was recorded on film and shown on previous page. Note the considerable edge fall-off. Setup consists of boom, tilt head, focusing rail, bellows, 105-mm lens, camera.



In order to illustrate what one can expect to see in a viewfinder window when copying slide, I removed my SLR's finder (camera at left) and rearranged my macro setup so as to shoot the camera's screen directly.

terribly important because, after all, the dupe will be mounted in the same kind of cardboard mount, and the border you've included in your dupe will be covered by the dupe's cardboard slide mount, right? Wrong! There's one little thing I've neglected to mention so far, which is that many of the viewfinders I checked did not do their clipping symmetrically. That is, they did not crop an average of 4% off the top, bottom, left, and right sides of the image, evenly all around. In many cases, they clipped my view of either one side or the other or of either the top or the bottom of the frame. When you painstakingly line up the image seen in such a viewfinder, so that the center of the viewing screen coincides as exactly as you can make it with the point you know to be the precise center of the image you want to duplicate, you will be playing a fool's game. If your viewfinder gives you an off-center view, you can be sure that your images will be off center, too. If your camera's viewfinder clips *very* asymmetrically, you can be certain that the borders you get on the dupes you shoot at 1:1 will also be very asymmetrical. Such borders will, most likely, show in the mounted dupes. To put it somewhat more simply, you just can't trust a camera viewfinder that clips asymmetrically to do any critically accurate composition.

Don't despair. You *can* use *any* 35-mm SLR to make super-accurate 1:1 dupes, or to do other critical work; it just takes a bit of work. Before I get into explaining how to go about it, it might be worthwhile to provide you with a relatively quick and simple procedure you can use to check your own viewfinder's performance. Who knows, you may find that the camera or cameras you own do so little clipping, and do it so symmetrically, that you needn't bother to take any special precautions with critical composition at all. (However, I know of only one such 35-mm SLR, the Nikon F, and it is no longer manufactured.)

To determine how much your camera restricts your view, you will need nothing more complicated than a standard lens, a copy stand (or a sturdy tripod), some lights, a fine-tipped marking pen, a sheet of white paper, a spirit level, and a ruler. If you have a copy stand (or an enlarger that can be converted into one), all you have to do is mount your camera (loaded with black-and-white film), using a spirit level to make sure that the film

plane is parallel to the baseboard, and turn the lens's focusing collar to its minimum-focus-distance setting. That done, tape a large piece of white paper to the baseboard and place your eye at your camera's viewfinder window. Adjust the camera distance from the paper until you are close to the critical focus. Use the marking pen to put a small "X" on the paper so that it falls within an area of your viewing screen that contains a focusing aid (such as a microprism spot or a rangefinder spot) and use a combination of the lens's focusing collar and the stand's camera height adjustment to achieve dead-on critical focus. Now all you have to do is to keep your focusing eye glued to the viewfinder window while you use the marking pen to produce a series of dots all around the border of the image that you are able to see in the viewfinder. Take some care while doing this, as many 35-mm SLR viewfinder systems are very critical with regard to the position of the viewing eye. Check to see if moving your eye position at the viewfinder window causes you to be able to see more along one edge of the screen and less along the opposite edge. This is quite often the case. Be sure, when viewing through such a camera, to place the dots so that *all* of them will be visible at the extreme edge of the screen for one eye position. Eyeglass wearers may find this procedure troublesome, but hang in there and by the second or third set of dots you'll get the hang of it.

If you don't own a copy stand, mount your camera on a sturdy tripod and set it so that the film plane is parallel to a flat wall. Tape a sheet of paper to the wall and follow the procedure offered above. If you can't get the camera very close to the wall, don't worry about it. Just make sure to focus very sharply at the closest practical distance and, if your arms are long enough, start making those dots.

Now all you have to do is use the marking pen and the ruler to connect the dots and then shoot a picture of your handiwork. After you soup the film, you needn't bother to print it; simply use the same ruler to measure the distance between the two sets of parallel edges of the rectangle you've drawn by connecting the dots. Then measure the two sets of parallel edges of the full image on your film. To determine the percentage of horizontal clipping, simply divide the distance between the vertical lines by the distance between the

SUMMER 1977



Slide of sailboat (left) was placed on light box. Using a macro lens, I set its reproduction ratio to just under 1:1. Then I adjusted camera's height on copy stand to bring this image to focus on viewfinder screen. I purposely lit the cardboard slide mount so that it would show up as white border surrounding image to illustrate difficulty of properly centering an image at 1:1. Note how thin these borders are along the vertical (long) edges of the screen as compared to the borders along the horizontal (short) edges. When image ratio is increased, vertical borders will disappear before the horizontal ones do, so it is necessary to accomplish image-centering at an image ratio smaller than 1:1 rather than to try to rely on the viewfinder to center the image once the 1:1 ratio has been established. But even this sort of procedure won't completely eliminate problems because my earlier test indicated that the screen provided an off-center view, as shown at right.



Another example of the peculiar results you can expect to get if you use the focusing screen of a camera that clips asymmetrically to do slide duping. I set the reproduction ratio of the macro taking lens on the camera to just fill the screen vertically and I set the slide to be copied so that its vertical borders, which still could be plainly seen, were of equal dimensions, to make this shot. I not only ended up with uneven borders along the top and bottom of the reproduced slide image, but got uneven vertical borders to boot, because of asymmetrical view of camera screen.

vertical edges, then multiply that number by 100. To determine the percentage of vertical clipping, divide the distance between the horizontal lines by the distance between the horizontal edges of the image and multiply the number so obtained by 100. Once you know the percentages of both horizontal and vertical clipping for your Supersnapperflex, you need only multiply these two figures and divide the product by 100 to obtain the amount of image area your camera is providing to

your eye. That's all there is to determining the numbers. But you're not through quite yet. There is some more very important information available to you on that film you've been measuring. You can easily determine whether your camera clips symmetrically or not by measuring the distance between the image edges and the sides of the rectangle you've drawn. If the distances from top and bottom and from each side are not exactly equal to each other, you will know that your viewfinder provides

you with a lopsided view of the scene recorded when you press the shutter button.

For those of you who may want to get a sneak preview of just how good or bad things are in your viewfinder, you can go through the same procedure (minus the film in the camera) up to the point where you've drawn and connected the dots, then run off and fetch a lockable cable release and a piece of thin groundglass, small enough to rest on your camera's inner film rails (but not on the outer ones). Open up the lens as wide as it will go, set the shutter to B, wind the camera (take care in this procedure, and also in the ones mentioned above, to insure that the camera does not move *at all* between the time you finish marking the dots and the time you finish shooting or inspecting the image), press and lock the cable release to hold the shutter open. Open the unloaded camera's back and lay the groundglass down on the inner film rails. Use a loupe to view the rectangle you've drawn and its relationship to the edges of the film-plane aperture.

And that, folks, is exactly the same procedure you will have to use to set your average 35-mm SLR up to do critical copying, if you find that your camera is a clipper, or much worse yet, an asymmetrical clipper.

Working this way, with a groundglass on the film rails, you can use your loupe to focus accurately a perfectly framed 1:1 dupe. Just be very sure that you don't move either the transparency you're duping or the camera while you remove the groundglass, load the camera with film, and shoot. If you are going to shoot more than one dupe, be sure to provide a set of index lines on your slide holder, which will allow you to align perfectly the edges of each successive slide to be copied with the position the first set-up slide was in. Otherwise you'll have to go through the whole time-consuming routine with the groundglass for each slide to be copied.

I mentioned earlier, if you will recall, that it's not only the slide dupers among us who will be stung, from time to time, by the 35-mm SLR's inability to show us everything that we are shooting. But until now I've gone on at great length only about such folk's problems. Now let's look at those photographers who want to print the full frame, complete with borders formed by the clear film edge. Snicker if you like, but there are lots of

Viewfinder accuracy of 48 SLRs

Camera Checked (Single Sample)	Percent of Image Dimension Visible in the Finder*		Percent of Image Area Visible in the Finder*
	Horizontal	Vertical	
Alpa 11el	95	95	90
Alpa 10d	97	93	90
Canon AE-1	96	92	88
Canon EF	93	93	87
Canon F-1	96	97	93
Canon T1b	96	93	89
Chinon CE-II	93	93	86
Contax RTS	92	92	84
Fujica ST901	91	91	83
GAF L-ES	93	97	90
GAF L-17	94	94	88
Kalimar SR 100	74	84	62
Kalimar SR 200	74	84	62
Konica Autoreflex A1000	92	90	82
Konica Autoreflex A3	93	97	90
Konica Autoreflex TC	92	92	84
Konica Autoreflex T3	91	91	82
Leicaflex SL	95	95	90
Leicaflex SL2	96	95	91
Mamiya/Sekor 1000DSX	94	92	87
Mamiya/Sekor 1000DTL	94	92	87
Minolta SR-T 100	94	94	87
Minolta SR-T 101	94	94	87
Minolta SR-T 102	94	94	87
Minolta XK	97	96	92
Miranda dx3	95	94	89
Miranda Sensurex	95	95	90
Nikkormat EL	92	92	85
Nikkormat FTn	91	88	80
Nikon F	100	100	100
Nikon F2	99	98	97
Olympus OM-1	96	96	92
Pentax ES	90	90	80
Pentax K2	93	94	88
Pentax Spotmatic F	91	92	84
Pentax Spotmatic II	90	91	82
Petri FTX	90	88	79
Praktica LLC	93	87	80
Praktica LTL	96	89	85
Praktica Nova 1B	87	88	77
Praktica TL	87	87	76
Ricoh TLS-EE	90	90	81
Rollei SL35M	96	94	90
Topcon IC-1	93	93	85
Vivitar 450SLD	93	91	85
Voigtlander VSL-1	97	94	91
Yashica Electro AX	94	95	90
Yashica FR	93	94	88
Average	92	92	85

*Rounded to the nearest 1%. For maximum accuracy, image-area numbers have been calculated from the *exact* horizontal and vertical percentages. Also, keep in mind that different samples of the same camera model may vary slightly in viewfinder accuracy.

continued on page 116



A Primer On Electronic Light Sources

Those magic little boxes of man-made lightning we call portable electronic flash may be photography's most useful accessory—and its most paradoxical as well. Though today's swiveling, energy-saving units make sophisticated flash shots a snap, creative technique seems as tricky and treacherous as ever. You still risk getting mired in a morass of flash math, psyched-out by superfluous electronic jargon, or just plain frustrated by failure to get Avedon-style lighting with a pocket flash stuck in your hotshoe. Whatever the reason, if electronic flash seems to have a slightly mysterious aura, you can be sure that the aura is obscuring just how versatile and practical flash really is.

What follows here should lift the veil of the flash mystique. You'll see that electronic flash is a natural, logical answer to a host of photographic problems. It's useful outdoors as well as indoors, by day as well as by night. It can make a run-of-the-mill photograph distinctive, and it can produce pictures you could get in no other way.

Perhaps flash will always remain a touch mysterious—because we never really see it. But most flash confusion has another, more down-to-earth source: the rules of flash *exposure* are just not the same as those of natural light.

Flash exposure always hinges on *flash-to-subject distance*. As light streams away from the flash head, it covers wider and wider areas—and so its brightness gets less and less. This "fall-off" with distance is a characteristic of all light sources, but we needn't worry about it with natural light—the sun is so far from us that everything on earth is effectively the same distance away.

With *automatic* flash, you usually don't need to worry about compensating for distance fall-off either. The unit's sensor circuits do it for you, by adjusting light *output* to give proper exposure.

Since auto circuits usually take care of exposure chores quite handily, it may seem surprising that much of what follows deals with exposure technique. The reason is that the "extra edge" in using electronic flash is knowing exactly when the auto mechanism can deliver the goods—and what to do when it can't.

Some of the simple tricks I'll be telling you about are used mostly by pros. From the brutal blitz of the graveyard-shift photojournalist to the soft and sculpted lighting of the portrait studio, flash and professional photography are a most compatible couple. Indeed, many pros have more invested in their flash systems than in their cameras. Unfortunately, this sometimes gives the impression that creative flash requires high-ceiling studios, high-fashion models, and high-priced flash equipment.

Well, fact is, you don't need heavy, expensive equipment or a fancy studio to get professional-looking results. As proof, every illustration in this article (with one exception) was shot with flash equipment you can buy or assemble for under \$125, and some of the units I used cost far less. The most elaborate studio setup was a roll of seamless background paper unfurled in my living room. While duplicating every effect shown here might run you \$300, you can see that a practical flash outfit is a relative bargain—not much more than the cost of a single high-quality accessory lens, for example.

Today's medium-power, medium-price units put out a lot of light—especially when you figure in today's fast films and lenses. Conversely, high output often lets you use the slowest, finest-grain films—a major advantage in 35-mm work.

Electronic flash's well-deserved reputation for virtually guaranteeing tack-sharp shots isn't only based on the fact that it lets you use fine-grain films. Flash output is extremely *short*—something that makes it different from other photographic light sources. Typical modern units flash for from about 1/500 second all the way down to a bullet-stopping 1/50,000 second. Subject movement or camera jiggle will almost never show up on film.

But the most important attribute of electronic flash is that it's a portable, controllable source of light—the "sun in your pocket," as one early pundit put it. As you peruse the following pages, you'll see just how handy this canned light can be.



Sharp as a cat's whisker: the short duration of electronic-flash exposure, combined with high light output and resulting small f-stops means flash shots can be super-sharp, even with skittish subjects. One medium-power unit was used here, mounted on a "table-top" tripod. Exposure was controlled by remote sensor.

Flash fundamentals

Today's run-of-the-mill auto flash units are so sophisticated and automated that you can clip one to your camera, twist a few dials, and proceed to shoot roll after roll of perfectly exposed pictures. But you can also get shots that only fill half the frame or are so grossly under- or overexposed that they're useless. The difference, of course, is in how you twist the dials.

The first one to twist is the shutter-speed dial. The instant the flash tube fires, the shutter must be fully open (i.e., the flash and shutter must be *synchronized*). If not, at least part of the image will be chopped off.

For most cameras, including almost all currently available 35-mm SLRs, this means that you've got to stick to the low end of your shutter-speed dial (what your instruction booklet calls "X-sync speeds"). The fastest synchronization speed for 35-mm SLRs is never more than 1/125 second; more commonly, it's 1/80 or 1/60 second.

While flash duration is so short that you need not worry about camera shake degrading flash exposure, in certain

situations (to be discussed later), faster sync speeds would be a definite plus. But alas, as long as 35-mm SLRs use focal-plane shutters with traveling curtains to govern exposure, sync speeds are unlikely to get much faster.

Except in special situations, you should always use the fastest X-sync speed available. But no matter what shutter speed you use, the flash won't know when to fire unless it has been electrically connected to the camera. If your camera's got a hot shoe, simply sliding the flash into the shoe does the trick. If not, you've got to wire them together using a "PC" cord.

The next dial to turn is the aperture ring of your lens. With an automatic flash unit, you must select one of the "working apertures" available for the film speed that you're using. Then the auto circuitry will adjust light output to give proper exposure no matter what your subject-to-flash distance may be—as long as it stays inside certain minimum and maximum operating distances. One advantage of more powerful units is that they offer a greater maximum auto range.

When you change film speed, the working apertures will also change. But, perhaps surprisingly, the minimum and maximum operating distances remain the same. Here's a typical example: for ASA 25 film, a unit has working apertures of $f/2$ and $f/4$, and the maximum range for these apertures is 20 feet and 10 feet, respectively. If you switch to ASA 50 film (one stop faster), the working apertures become $f/2.8$ and $f/5.6$, but the operating ranges remain the same.

Generally speaking, more expensive and powerful units offer a greater choice of working apertures than smaller, cheaper ones. Increased aperture choice means greater depth-of-field control; when coupled with "energy-saving" circuitry, this means greater control over recycling time and power consumption as well.

The best way to know the maximum operating ranges or which working apertures go with which film is not to learn them at all. Instead, learn to use your calculator dial, which contains all the info you need. While calculator dials differ in intelligibility (and one or two seem to have been designed by utter morons), most can be mastered in a few minutes with the aid of the instruction book. It pays to master the dial—the alternative is always having numbers



From minis to mashers: today's portable flash runs the gamut from low-power pocketables to two-piece pro-style rigs. In center, Minolta's diminutive Electroflash 20, a manual-only unit with an ASA 25 guide number of 33. With batteries, it weighs 5 ounces. On the left, the popular, medium-power (GN of 60), system-style Vivitar 283, featuring a tilting head for bounce, energy-saving circuitry, and numerous accessory "lenses," filters, and power sources. At right, the most powerful portable: Braun's F900 Professional boasts a GN of 103, has separate nicad power pack. Total weight is about 6 lbs.

swimming in your head. To see how easy reading a calculator dial can be, check out the decoding of a typical dial shown below.

While auto operation will get you through most picture-taking situations quite handily, you must always remember that your unit's automatic light meter, called its sensor, shares one characteristic with all other auto-exposure mechanisms—it's dumb. As the computer boys say, "garbage in equals garbage out"—if the sensor isn't reading the main subject, there's no way it can adjust flash output to expose it properly.

Most sensors (but not all) have an acceptance angle of about 20 degrees—roughly the largest circle you could inscribe in a 35-mm SLR viewfinder with an 85-mm lens up front. So, with a normal lens, a subject filling the central part of the field will always be properly exposed. But you'll have problems if you're sporting a 24-mm wide-angle and your subject is off near the edge of the frame.

When you suspect that the auto mechanism won't deliver the goods, the prudent thing is to switch your unit to manual—or to use a manual-only-type flash to begin with. Manual simply means that each flash from the unit contains a fixed amount of light—usually the very most the unit can produce. You,

not a sensor, control exposure by changing the lens aperture as flash-to-subject distance changes.

You can find the aperture you need to set manually via two methods. If you're not mathematically inclined, the easiest way is to consult the calculator dial. If you've dialed in the ASA you're using, you can simply read off the aperture



Conquering the calculator dial takes but a few minutes, and pays off in faster, more confident flash operation. On Braun's 34VC (shown here), I've dialed in ASA 100. The three color-coded arcs give the maximum and minimum auto operating distances for the three available "working apertures." The arrow at the end of each arc indicates the proper aperture. For manual operation, the lens aperture is found opposite the particular flash-to-subject distance used.

Contrast Control with Fill Flash



(a) Sunlight—no flash.



(b) Sunlight with fill flash.



(c) At dusk—no flash.



(d) At dusk with flash.

Outdoors, flash lets you manipulate overall contrast and "snap" with some subjects. In photo (a), natural light is too directional and harsh. In (b), flash "fills in" shadows, yet preserves highlight distribution of still-predominant natural light. In (c), natural illumination is soft, dim. Photograph (d) has greater snap because flash, held off-camera, adds "modeling" and directional quality to lighting.

that's recommended for any flash-to-subject distance.

The second way is to use "guide numbers" (which I'll sometimes abbreviate as GN). This concept does double duty: it's both a way to compute the proper f-stop quickly, and a handy and popular (but not very objective or scientific) way of rating a flash unit's maximum light output.

A single unit has many guide numbers, each corresponding to a particular film speed. That's why the ads say "GN of 40 with Kodachrome 25" or "GN of 80

with ASA 100 film." Incidentally, these two statements describe the very same flash unit.

To use guide numbers to select the proper f-stop, simply divide the appropriate guide number by the flash-to-subject distance. The result is the f-stop needed. Thus if the GN is 80 and the flash-to-subject distance is 10 feet, the suggested f-stop is $80 \div 10$ or f/8.

Guide numbers are usually given in feet, but sometimes, particularly with European units, they're given in meters as well. Watch out! A GN of 65 in feet

shrinks to a GN of 20 in meters.

Because guide numbers tell you how much to stop down your lens, they can serve as an approximate measure of light output. For example, consider two units, one with a GN of 40, the other with a GN of 80, both rated for the same film speed. At 10 feet, the first must be used at f/4, the second at f/8 (assuming manual operation). So the second flash is two f-stops (four times) more powerful than the first. Similarly, a unit with a GN of 56 is twice as powerful as one with a GN of 40.

Today, units with ASA 25 guide numbers of under 35 are classed as "low-power, shirt-pocket" flash guns. From 35 to 65 is the domain of the intermediates, and above 70, you'll find mostly large, powerful, and heavy pro-style handle-mount units. Beyond about GN 100, electronic flash units cease to be portable, unless you're into aping King Kong.

Any flash, from the pocket mini to the elephantine studio units some pros use, is ultimately just an energy converter, i.e., a device for changing electrical energy into light energy. In portable units, that energy comes from batteries. Some units take the disposable alkaline-manganese type, others use rechargeable nickel-cadmium (nicad) cells. Most high-power, pro-style units can also be powered by a large, 510-volt carbon-zinc battery, but these are only of interest if you're willing to carry around two pounds of battery in order to get very fast recycling and a large number of flashes.

Many nicad flash units have built-in batteries, so you must plug the entire unit into the wall socket to recharge. But more and more units are featuring interchangeable nicads. Several new systems-type units feature a broad range of power-supply options. For example, Vivitar's 283 can be powered by AA-size alkalines, interchangeable nicads which recharge in a remarkable 15 minutes, a 510-volt carbon-zinc job, or the nearest a.c. outlet.

Which power supply is best for you depends on your personal shooting style; I'll give you the pros and cons of each type toward the end of this article. If you select a disposable-battery unit, don't succumb to the temptation to substitute the cheaper carbon-zincs in place of alkalines; your payoff will be fewer flashes and sluggish performance. If you don't plan to use the flash for a while, remove the batteries so that the

chamber won't be ruined if the batteries leak. (This isn't nearly the problem it used to be, but it still happens occasionally.)

With nicad units, it's good practice to charge the batteries every few months even if you're not using the flash—frequent charging keeps nicads in tip-top shape. But if you forget to charge them for a while, nothing disastrous is likely to happen, because present-day nicads need less coddling than some instruction-booklet writers would have you believe.

Whatever type of battery you use, you'll squeeze more flashes out of your automatic unit if it incorporates the new "energy-saving" circuitry. To see just what this circuitry does, let's take a quick look at the insides of a typical unit.

A non-automatic flash has three basic components: an energy source (batteries); an energy accumulator, called a capacitor; and a tube filled with xenon gas, known naturally as the flash tube. In addition, there's electronic circuitry and a reflector whose shape determines the distribution of light in the output beam.

Auto flash adds two building blocks: a sensor circuit to stop light output when just enough has been emitted to give proper exposure; and a mechanism for dealing with the extra energy in the capacitor when all isn't needed for proper exposure.

This mechanism can be either energy-saving circuitry or a "quench tube." Quenching was the original solution to the problem of what to do with excess capacitor energy: the quench tube, "buried" inside of the flash unit, simply wastes the excess energy in an unseen burst of light.

Quench tubes are still used on "standard" auto units. Their main advantage over the energy-saving (ES) design is that they're cheaper—at least when it comes to buying the unit. But when it comes to conserving battery power, ES units win hands down. That's because the ES circuitry allows the extra energy to remain in the capacitor, where it's immediately available to power the next flash. So if little energy was consumed in the previous exposure, recycling can occur almost immediately. And since the flash doesn't waste any energy, it's possible to get many more flashes before having to throw out your alkalines or recharge your nicads.

One caution: ES units employ components called "thyristors" and



Sunpak 311 calculator dial has power-ratio feature, here set to $\frac{1}{4}$ power. As a result, unit's guide number is reduced from 40 to 20 ($\frac{1}{4}$ power = two stops less light).

often the word "thyristorized" is used in place of "energy-saving." Unfortunately, thyristors (which are really just electronic on/off switches) are also found in some non-energy-saving units, so careless use of the term can be misleading. But while you can't rely on the description "thyristorized" to spot an ES unit, there are a couple of dead giveaways: a variable recycle time (such as 0.5 to 8 seconds) and a range such as 50-500 for the number of flashes per charge or per set of batteries.

Another useful feature available for some of the more sophisticated auto units is the remote sensor. This is simply a sensor that is wired to the flash but

physically separate from it. The advantage: you can mount the remote sensor on your camera's accessory shoe and ensure that it reads from camera position no matter where the flash itself is placed or aimed, subject to the limitation that remote sensor cords are typically only about four feet long.

Flash outdoors

Just because flash is king indoors doesn't mean it has to play second fiddle when you shoot under that great tentlight known as the sky. When the sky is dark—at night—flash is the obvious recourse. But even when the sun is above the horizon, a modestly powered flash unit can sometimes dramatically improve your pictures.

Flash can modify—and even totally submerge—the natural illumination, thus it can free you from dependence on atmospheric conditions and the sun's position. If the ambient light is too snappy, flash can "tone it down"; if it's too flat, flash can add a little sparkle.

Suppose, for example, you're photographing a girl on a crystal-clear sunny day. Sure you know cloudy days are best for this sort of thing, but it's your winter vacation and you've flown 1,000 miles to be in the sun. How do you get good pictures?

If you face her into the sun to get even illumination, she squints. If you turn her



How I shoot outdoor flash close-ups—see "Macro magic flash" on page 63 for details.



Used with an Olympus OM-2 camera, the Olympus Quick Auto 310 flash offers a clever and unique answer to the common problem (especially prevalent outdoors) of getting sensor acceptance angle to match that of the camera lens. Instead of the sensor in the flash controlling exposure, the OM-2's through-the-lens meter takes over. This amazing feat is possible because the OM-2 uses fast-acting silicon blue cells to monitor the actual film surface during flash exposure.

half-way around, flare from the sun softens and desaturates the image. So you compromise on some intermediate position—and confront inevitably harsh shadows.

You can soften those shadows with flash. Because it adds roughly *equal* amounts of light to both the sunlit areas and the shadows, on-camera "fill" flash can lower the contrast between them.

If that seems surprising, look at it this way: suppose in the original scene the highlight brightness measures 20 arbitrary "light units" while the shadows register only one unit. If you add 10 units of light to each area with flash, the highlights will measure 30 units and the shadows will measure 11. That's a contrast ratio of about 3 to 1—a lot lower than the 20:1 ratio you started with.

Practically speaking, this means that fill flash gives you shadow detail where natural light alone would only give you black. It's especially useful with color slide films, because their inherently low exposure latitude means that you must have low-contrast lighting if you want to capture detail in both highlight and shadow areas.

Fill flash (also called "synchro-sun") is a most useful trick, and pros use it routinely on subjects ranging from fashion models to autos. For the amateur (and many pros as well) there's

only one catch: unless you've got a special, leaf-shutter-type camera, you won't be able to use fill flash if you're also using a high-speed film such as Tri-X.

Here's why: With ASA 400 film, a typical subject in bright sun requires an exposure of $f/16$ at $1/250$ second. Since flash adds light, your final exposure should be even less, say $1/500$ at $f/16$. But you can't exceed the maximum electronic-flash synchronization speed, and with a 35-mm SLR that means $1/60$ or at most $1/125$ second. Alas, $1/500$ at $f/16$ translates to $1/125$ at $f/32$ or $1/60$ at $f/45$ —stops that very few lenses for 35-mm cameras possess.

There are two ways out of this jam. Usually, the most practical solution is to switch to a slower film, which is a better idea in bright light anyway. But you can also ditch your 35-mm SLR and grab a Hasselblad, Mamiya RB-67, or any other camera (including any one of a host of 35-mm rangefinder models) that uses an inside-the-lens leaf shutter. These cameras synchronize with electronic flash at any speed. That's so desirable a feature for professional flash work, incidentally, that several manufacturers of large-format cameras with focal-plane shutters (including the Rollei SL66 and the Pentax 6x7) offer one or more special lenses for flash work that have their own built-in leaf shutters.

Assuming you've avoided the fast-film trap, the next fill-flash question is: How much light should you add—and how do you get just that amount out of your flash? Generally the rule is to add an amount equivalent to between $1/4$ and $1/2$ of what is falling on your subject. If you add more, you risk a washed-out, artificial look. Add less and you may not see the effect of the flash at all.

There are several techniques for getting just the right amount of fill light. They aren't especially difficult, but they do need a little explaining. You'll find all the details in the accompanying box.

The somewhat specialized but eternally fascinating domain of close-up nature photography provides another intriguing application of outdoor flash. Here the trick is to use the flash so close to the subject that its instantaneous brightness far exceeds that of the sun. As a result, you can stop your lens way down to get the large depth of field that three-dimensional close-ups require. And subject movement, whether it's a flower blowing in the breeze or an insect

crawling on a twig, is frozen by the brief flash burst.

The surprising thing about close-up flash is that it's extremely easy to get professional-quality results. Moreover, it's one of those rare applications in which small, inexpensive equipment is usually even better than large, expensive hardware. In particular, low output is preferable and auto circuitry isn't necessary, because you can't really use it in the close-up range. The technical details are in a special box on Macro Flash. If you consult it, you'll see that after a simple "calibration" test, you can use a small manual unit at a fixed f-stop (usually between $f/11$ and $f/16$) for *all* your macro shooting. It doesn't matter if you change flash-to-subject distance or camera-to-subject distance. In effect, you can use a manual unit as if it were an automatic. On the face of it, this seems to contradict most of what you've read so far. But in fact it doesn't; in the macro range, a number of optical effects too complex to discuss here cancel each other out, and this gives rise to the serendipitous outcome described above. Remember, though, that this remarkable technical simplification works only in the magnification range from $1/5$ life-size to full life-size on the film.

Using an "artificial" source such as flash to illuminate natural subjects out in the field may seem "unnatural" to some of you. But, strangely enough, when it comes to nature close-ups, a flash unit often gives a *more* natural look than natural light itself.

For one thing, by allowing you to stop the lens way down, flash yields a picture with more information about the subject. At the wider f-stops required in natural-light shooting, much of the subject will be lost forever in an out-of-focus blur. But we "normally" see close-up subjects with exaggerated depth of field, because our brain gets around the depth-of-field problem by constructing a mental "composite" of rapidly scanned single images. So a flash close-up is usually more in accord with what we've learned to expect from a macro image.

Moreover, a bare flash held close to a macro subject isn't nearly as harsh and unnatural a light source as you might imagine. In ordinary flash situations, the flash acts as a "point source," beaming light in only one direction. Harshness is really just another name for this high degree of directionality. But when a flash unit is close to a macro subject, the

subject will "see" a relatively *large* light source. Light from one end of the flash head will hit the subject from a direction different from that of the light from the other end. The net effect is that shadows cast by one part of the flash will be softened by light coming from the other parts.

The last application of outdoor flash that I will discuss here is the most obvious one—using it at night. After sundown, a flash unit is the key that opens up a whole new world of action and imagery—a world utterly inaccessible without the magic of flash.

Most commonly, electronic flash at night captures public activities and events: parades, carnivals, demonstrations, and the like. While night is the traditional stalking ground of the news photographer, it offers a rich image harvest to us all. Because of the prevailing darkness, people often express themselves more vigorously and uninhibitedly, and the alert flash photographer can record striking images.

This sort of shooting is not without its dangers, of course. Flash at night may be perceived by some subjects as an assault, so unless you're prepared to fight, surrender your film, or run, it's best to be discreet in your choice of subject matter. But there are plenty of situations in which you can get away with most anything by just pretending that you're a

stringer for some downtown daily. And if you come up with anything really dramatic, by all means take it downtown—that's exactly how a number of top press photographers got their start.

Shooting events at night poses some tricky exposure problems. Because you're usually working with fast-moving situations, you don't want to be stuck having to change apertures constantly. So auto operation is highly desirable. But auto almost inevitably yields a number of totally botched exposures, particularly if you're using low-latitude color slide film. If the sensor is reading the sky instead of your subject, you're going to be mighty overexposed.

If you roughly center your subjects and stay in the 35-mm to 135-mm lens range, the vast majority of your night exposures will be fine. If you want to use a 28-mm or 24-mm lens and don't always want the main subject in the center, one trick that'll improve your odds of getting acceptable exposures is to program a "sky" factor into the lens aperture you use. Suppose you figure that, on average, your sensor will be reading one-half sky and one-half main subject. The sensor will be telling the flash to emit *twice* as much light as is necessary for proper exposure. You can compensate by actually setting the lens one stop smaller than the "normal" working aperture. Of course, the price



Because this Mardi Gras couple was willing to pose, I had the time to use manual exposure control, always the safest technique when "grab shooting" outdoors at night. For proper exposure on "auto," the main subject should be centered.

you pay is a one-stop underexposure when the main subject fills the entire sensor-intake angle. The obvious conclusion for wide-angle lovers: when you can work manually at night, do it.

Flash indoors

Whether you shoot high-fashion mannequins or just the kids' birthday parties, two factors make indoor flash different from the outdoor variety: (1) walls and ceilings can affect your results, and (2) you can use more complex, sophisticated lighting equipment.

Walls and ceilings are important because they act as giant "bounceboards," modifying and redirecting the light. Thus they can be a most valuable flash "accessory"—or a bugaboo that can ruin the results of an entire session. Reflective walls in a small room can hype up your guide number, a lovely aquamarine ceiling can give your girlfriend's face a sickly cyan tinge, and a white ceiling of average height can turn a single naked flash unit into a soft, flattering, window-like light source.

This last effect is naturally quite popular. It's called ceiling bounce and has so captured the imagination of the photographic public that many newer flash units are equipped with tilting and



In printing this night-flash shot, taken on Halloween, I exploited the broad latitude of b&w film to change the apparent lighting. Because the clown was closer to the flash, he received considerably more exposure than the couple in the rear. After dodging and burning, he ends up looking somewhat darker than the other figures.

Changing Flash Position Gives Different Lighting Effects



Ceiling bounce can give soft, pleasing lighting. It enhances cheekbones and eyelids, and casts shadow on the neck.



On-camera flash.



Flash hand-held to left.

On-camera flash gives frontal lighting, which can appear "flat" if subject is facing the camera—especially in a modestly sized room with reflective walls. Moving flash off camera by hand-holding it to the left gives increased "modeling;" more pronounced shadows add a three-dimensional look.



Flash at 45 degrees to subject.



Flash at 90 degrees to subject.

Moving flash unit farther to one side (this time to the right) enlarges the shadow areas and, especially with a "bare" flash, tends to give a harsh, unflattering look. But in multiple flash setups, the 45-degree position is commonly chosen for the "dominant" light—the shadow areas are then "opened up" with fill.



Bottomlight.



Toplight.

Light coming from beneath subject rarely is used in conventional portraiture; it's "unnatural" and seems eerie, ghostlike. Toplighting often looks like exaggerated bounce lighting; here it gives a dramatic, "fashion model" effect.

swiveling flash heads, which make a variety of bounce techniques especially easy to do. With ceiling bounce, the subject is illuminated by light from a largish patch of ceiling, which in turn has been directly illuminated by the flash. The effect is roughly the same as though a window had been cut into the ceiling.

The major attraction of bounce flash is that it's the easiest way to "soften" or diffuse the flash output. The "quality" of the light that bounces down on your subject from the ceiling is very different from that coming directly from the flash head. Instead of radiating out in straight lines from a single "point," bounce light hits the subject from several directions at once. So transitions between highlights and shadows are more gradual, less harsh. Detail is revealed, but not in the stark relief almost inevitable with undiffused sources.

While the harshness of a single undiffused flash can often be used to advantage, especially for dramatic, graphic effects, much of the excitement and creativity of indoor work involves softening direct flash to give a more natural and/or flattering look. Ceiling or wall bounce can be an easy way to get these effects—if you steer clear of a couple of major pitfalls.

One practical problem with bounce has already been alluded to, namely that an off-color ceiling or wall will impart its hue to a color shot. Bouncing off a green ceiling is rather like shooting with a green filter over your lens. Of course, strongly hued ceilings are a rarity, and with color negative films, a certain amount of color imbalance can be corrected in printing. On the other hand, (1) some ceilings and walls have more color in them than you'd imagine, and (2) knocking an unwanted tinge out of a color *slide*, if possible at all, requires an expensive custom dupe.

Bounce pitfalls are not limited to color rendition. Getting proper exposure with any film can be tricky. For one thing, on "auto," your sensor must keep facing the subject while the flash head points toward the ceiling or wall. With units sporting tilt and/or swivel heads, this isn't a problem—but with a conventional unit, you're out of luck unless you can buy a remote sensor. Note also that if your head tilts but doesn't swivel, you won't be able to bounce off the ceiling when the camera is held vertically—unless you remove the flash from your camera's accessory shoe.

Even swiveling heads and remote

sensors won't get you out of another big auto-bounce trap: going beyond the maximum auto distance range without realizing it. One contributing factor is the extra distance the light must travel, to the ceiling and back. More insidious is the contraction of your auto range due to ceiling light absorption and scattering. For example, suppose your flash has a 20-foot maximum range at the f-stop you're using. If the bounce surface absorbs half the light (a one-stop absorption), then your maximum range shrinks 30% (to 14 feet) and if the ceiling or wall absorbs three-fourths of the light (a two-stop absorption), the range drops 50% (to 10 feet). The problem is that you never know what your maximum range actually is unless you measure the reflectivity of the bounce surface.

Fortunately, flash engineers have come up with a neat solution to this potential headache in the form of a "sufficient light indicator" or "confidence light." If you plan to bounce a lot, spending a few extra dollars to get a unit having one of these gizmos is a good investment. Using the confidence light is simple: before you expose any film, press the open flash button and see if the green light starts to glow. If so, everything is all right. If not, switch to a wider auto aperture (if you can) to



The cheapest umbrella/modeling light setup: a Spiratone umbrella, a light stand, a clip-on incandescent socket and reflector, and the most powerful flash you've got. Ideally, flash head and incandescent light should both be on the umbrella's "axis" (its handle); more importantly, they should be as close together as possible if you want to see exactly what you'll get on film. Don't use too powerful a bulb in your socket—umbrella fabrics are flammable.



Not for the weak-wristed, the \$50 Shoulder Soff Box from Larson Enterprises is an efficient, portable soft-light source with wide-angle coverage. As shown, it's "automatic"; the wire running down the column connects the on-camera remote sensor with the Vivitar flash at the rear.

extend the effective range of your unit.

While tilt/swivel heads and confidence lights can make wall and ceiling bounce a simple procedure, all is not lost if you've got a less sophisticated flash unit. To get proper exposure, you can guesstimate or measure the distance from flash-to-ceiling-to-subject, use your guide number to get the recommended aperture, and then open up the lens about one stop to compensate for light loss at the ceiling. If this seems to be too much hassle, a "quick and dirty" technique that works well in average situations is to compute the lens aperture using the distance on your lens's focusing scale, and then open up two stops.

Ceilings and walls may be the handiest surfaces to bounce off, but they're not the most flexible. So a movable "bounceboard" or reflector of about 3x6 feet is a useful flash accessory—and you can make one yourself for only a few dollars. Masonite or a similar material covered with aluminum foil (first crinkled and then reflattened) and supported by a wooden stand, is one way to do it, or you can just use a piece of sturdy illustration board. If you take the latter route and plan to shoot color, though, be sure the board has neutral coloration.

Properly positioned, a bounceboard can turn a single flash into a "multiple"



A standard three-light setup gave this pleasing portrait. Main light (a Soff Box) was placed higher than subject and at a 45-degree angle; fill came from an umbrella near the camera. A slaved bare flash behind subject emphasized hair outline against dark gray background paper.

light source. For example, you can aim the flash so that its beam illuminates one side of the subject directly, while the rest hits the reflector, which bounces it toward the other side of the face. The reflector will act as a fill source, lightening (but not eliminating) the shadows cast by the main light.

The most flexible device for controlled bounce lighting is the photographic umbrella. Looking very much like the conventional wet-weather variety, it functions as a lightweight curved bounceboard that can easily be fitted to and positioned on a lightstand. A flash is mounted near the end of the umbrella handle and is aimed at the underside, which has a reflective surface. The subject is illuminated by a broad light beam that is directional, yet soft, even, and dispersed.

The smooth, almost tactile quality of umbrella lighting has made it perhaps the single most popular professional source of illumination. Umbrella light can be extremely flattering; moreover, it can be fine-tuned: the size, shape, and type of reflective surface all influence the quality of light produced. The softest light comes from a large, rather flat umbrella with a matte-white reflecting surface. More directionality and contrast is provided by a curved, silvered umbrella. Some professional-quality umbrellas (which start in the \$40-50 range) offer interchangeable fabrics and a shaft-locking system that allows the fastidious pro to vary umbrella curvature

to get just the effect he wants. Pros usually have low-power tungsten modelling lights built into their monster flash units so they can see just what they'll be getting on film, but a simple clip-on lamp socket plus reflector (see accompanying photograph) can give you much the same information.

Since umbrellas cause considerable light dispersion and loss, they require a fairly powerful flash unit—at least one in the GN 50-60 range.

All the techniques described so far involve softening light by *reflecting* it. But you can also soften flash by putting a large sheet of *diffusing* material between it and the subject (a small sheet directly over the flash head has only a limited effect). One possibility is to place your umbrella between the flash and the subject and shoot *through* it—special translucent umbrellas are made for precisely this purpose. Or you can experiment with matte acetate or similar materials—but remember the possibility of color shifts due to selective transmission.

The most efficient "transmission-diffusion" sources use the "light box" design: an enclosure with reflective walls that trap and "recycle" the light that doesn't get through the diffuser on the first try. One intriguing new product using the light-box principle is the "Soff Box" (from Larson Enterprises); it's available in a small, portable model that offers the on-location pro a totable "window of light" that will cover the angle of view of most any lens longer than a fish-eye.

Up to now, we've looked at techniques and devices that vary the quality of light from a single flash unit. One other factor obviously influences the "look" of a single-flash shot, namely the *placement* of the flash relative to the subject. If you look at the photographs and captions on page 56 you'll see the main consequences of moving one flash to various positions.

Exploiting flash-position effects is the name of the game when you use more than one unit. Generally, in multi-flash technique, one "main" source (whose brightness determines the basic exposure) is placed to give the desired shadow and highlight distribution; a second "fill" light of lesser intensity softens the shadows and gives a "modelling" effect; and a third light aimed at the background provides "separation" between it and the subject. Sometimes a "hair" light is also used—

aimed down on the subject from above and a little behind, it adds sparkle to just what you'd think.

While this isn't the place to explore the intricacies of modern multi-light portrait technique, the following should provide enough guidance to launch you on your own experiments or serve as an introduction to the various texts on the subject. (If you'd like a fuller discussion of professional techniques suited for amateurs, write to Ponder & Best, importers of Vivitar equipment, for their free booklet, *How To Use Multiple Flash*, by that master of glamor, Peter Gowland himself.)

The single most common and versatile main/fill arrangement is to place the main light higher than the subject and at an angle of about 45 degrees. The fill goes near the camera, usually (but not necessarily) on the same side as the main light. If you're shooting color, the fill should have roughly half the intensity of the main source. For softest results, both lights should be bounced off umbrellas, bounceboards, or the like. But if your main light is bounced and the fill isn't too bright, it needn't be diffused if it's placed near the camera. If your subject has excessively broad facial structure and you want to narrow it down, pose her or him so that the main light falls fully on the side of the face turned away from the camera. Conversely, narrow faces can be broadened if the main light falls on the side of the face turned toward the camera.

While it's theoretically possible to use auto flashes in their auto mode in multi-



Slave unit such as Vivitar SL-2 shown here can be useful in multi-flash setups.

light setups, practically speaking, you'll save yourself endless headaches if you switch them to manual. But then you've got the problem of not knowing what "guide number" to use when your flash is hooked up to an umbrella. You can, of course, "calibrate" your own equipment by running a test series on transparency film. But if you're serious about multi-flash, a flash meter is a good investment. A flash meter does for flash just what an ordinary light meter does for natural light—it tells you what f-stop to use for any flash/film combination. Since flash meters are used mostly by pros, they tend to be super-precise—and expensive. But as you'll see later, there's at least one quite usable flash meter with an amateur price tag.

All multi-light setups require some means of synchronizing the various units. One way is to use long PC cords and feed them all into your camera with an inexpensive "multiple PC adapter." The disadvantage is that you have all those cords lying around and perhaps getting unstuck. So-called "slaves" offer a more elegant solution. A slave is a flash trigger that responds to the light from a "master" flash. Thus, if the master is wired to the camera, slaved flashes will be synchronized perfectly even though they're not electrically connected to the camera. Unfortunately, photographic slaves tend to be disobedient; they'll work fine in one setup but not in another. Alas, only experience will teach you the quirks of your particular unit.

One final tip: if professional-style portrait and modelling work intrigues you, an excellent primer to read is Kodak's *Professional Portrait Techniques* (No. 0-4; \$2.50 from your photo dealer). With lavish illustrations and a precise text, it'll tell you all you need to know about light placement, light ratios, even how to paint your own backgrounds or camouflage prominent ears. There's even a four-page spread on how to apply makeup properly!

How to choose a flash

Selecting the best electronic flash unit for your needs involves answering a series of interrelated questions. To wit:

(1) How much light output do you want?

(2) What "coverage" (width of the light beam) do you need? If you're a wide-angle freak, can the unit take plastic "lenses" that increase coverage



Current flash units include many size, power, feature, and price choices.

(but diminish guide number)?

(3) Do you want a manual-only or automatic unit? If the latter, should it be a standard auto or an energy-saver? And how wide a range of "working apertures" will you need?

(4) What type of power source is best for you? Would a unit offering several power options be worthwhile?

(5) Do you want a conventional head, a tilting head, or a tilting and swiveling head?

(6) How much bulk and weight can you tolerate?

(7) How important are the "little extras" such as a lock on the mounting shoe or a confidence light?

(8) Do you want a "system" design that takes lots of accessories?

(9) The bottom line: How much do you want to pay?

I can't answer these questions for you, of course, but I'll offer some facts and opinions that hopefully will make selecting a compatible flash unit a little easier.

Regarding light output, don't be unduly swayed by slight differences in the manufacturer-supplied guide number. There's always a big difference between GN 28 and GN 56 units, but there may not be any significant output difference between, say, GN 56 and GN 60 models. The reason: "guide number" is an imprecisely defined unit of measurement; despite continued attempts to agree on a standardized definition, various manufacturers measure the GN in different ways. So choose an approximate GN on the basis of your needs and pocketbook, and make your final choice on the basis of

other features.

Another, more precise unit of light output you may encounter is the BCPS (beam-candle-power-second) rating. It's an exact measure of output—but only in the very center of the beam. So it too can be misleading; a flash that can only cover the field of a 50-mm lens will have a higher BCPS rating than one that puts out the same amount of light but spreads it to cover the field of a 28-mm optic.

The two flash units I've just described will also have different guide numbers. That's one reason it's important to check a unit's coverage. The other reason is obviously that wide coverage is essential if you use wide-angle lenses. Most, but by no means all, units can adequately cover a 35-mm lens on a 35-mm camera. But a number of units feature 28-mm-lens coverage. Unfortunately, most manufacturers are in the habit of disguising coverage specifications; they say "65 degrees by 50 degrees," rather than spelling out the equivalent focal length. The accompanying table (for 35-mm cameras only) will enable you to decipher such angle data.

One more point about coverage. Just because a flash unit "covers" the field of a 24-mm lens doesn't mean that it covers such a wide field evenly. Illumination fall-off at the margins of the field is a fact of life with all flash units, but high-quality units cover considerably more evenly than "Brand X" types, which can "hot spot" badly in the center. Then again, with most subjects, hot spotting isn't especially apparent or disturbing. If hot spotting worries you,

you should check the output in various parts of the field with a flash meter, or take a test shot of a flatly lit wall.

Since manual-only units seem a vanishing species in all but the lowest price range (and some professional studio equipment), most of you will be choosing between the standard autos and the increasingly popular (and more expensive) energy-savers. If you like fast recycling and hate to change batteries, ES circuitry is far too appealing to resist. Whether it'll actually save you money is something else again; unless you use your unit a lot, it may be years before battery savings outweigh the extra initial cost of ES circuitry.

A similar argument holds when you consider the choice between the more-or-less permanent nicads and disposable alkaline-battery power. Although you have to shell out each time for fresh alkalines, it takes a while before you recoup the higher initial cost of nicads. And you almost always get more shots with an alkaline-powered unit before the batteries poop out than you do before nicads need to suckle at an a.c. outlet. So alkalines (or *removable*, fast-charging nicads) are best if you might shoot hundreds of shots in a single day. If you use flash rarely, then alkaline power is the only way. Nicads are ideal for the photographer who doesn't shoot all that much in a single session, but uses his unit regularly.

Since most nicads give only about 50 full-power shots before requiring recharging, if their long-term economy appeals to you, it's wisest to get an ES nicad unit; this is especially true if the nicads are noninterchangeable.

Speaking of batteries, if you're in the market for a cheap, low-power alkaline unit, be sure to check the battery compartment cover: does it fit solidly or does it fly off easily? If the latter, you'll sooner or later have to put the flash on the inactive list because you've lost the cover out in the woods. Believe me, I know.

With any unit, check for a readable calculator dial. And if you can turn it without risking finger lacerations, you'll be ahead of owners of at least one well-known line of flash equipment.

A final touch I especially like is a lock on the flash "foot." Reason? Well, if you like to experiment, sooner or later you'll find yourself sliding your unit into the loose-fitting accessory shoe of some gee-gaw. You'll tilt it at a funny angle and, without a lock, whammo!



If these two Hanimex flash units look almost identical, that's because they are: the only difference is that one is a conventional automatic and the other (on the right) has ES circuitry.

A look at some hardware

With literally hundreds of flash units on the market, and almost two dozen manufacturers competing for your flash dollar, getting a handle on your options can be an arduous experience. While what follows is by no means a complete survey of portable flash hardware, it will introduce you to some of the major product lines.

While almost all units are "accessories," you can get cameras with built-in flash, generally in the 110 format. Minolta, Vivitar, and Honeywell, among others, give you the option of sacrificing some of your pocket camera's pocketability in favor of flash-at-your-fingertips. There's also at least one 35-mm camera with built-in flash—the Konica C35-EF. It's a lightweight, moderately sized, scale-focusing automatic, and the flash unit, which pops up into operating position at the flick of a button, has an ASA 25 guide number of 23—not overwhelmingly powerful, but certainly adequate in the "grab-shot" situations for which the camera is intended. Flash exposure is automatic: as you turn the focusing ring, the lens aperture is adjusted to give proper exposure at that distance.

When you're shooting flash outdoors, the Konica C35-EF will automatically select the aperture corresponding to the

brightest source (natural light or flash), thereby increasing your chances of getting good fill-flash results without overexposure. Two ready-lights are provided, one atop the camera and the other right next to the viewfinder, so you can see it while composing your picture. Incidentally, the C35-EF concept has proven so popular that Fuji will be marketing a similar design in the near future.

Before leaving cameras, mention should be made of Canon's AE-1 35-mm SLR and its special energy-saving flash, the Speedlight 155A. Although the 155A is an accessory flash, it's "integrated" into the AE-1 system in an interesting way: when you slide the 155A into the AE-1's shoe, the actual shutter speed becomes the X-sync speed of 1/60 second—no matter what's been set on the shutter-speed dial. And a proper working aperture for the film in use is set automatically, too—provided you've dialed the correct ASA into the flash.

To begin our tour of accessory flash units, let's start with Sunpak, Japan's largest independent flash maker. They've got an extensive, well-thought-out line that includes five manual models, four standard autos, five ES autos, and special units for underwater work and infrared flash. All can be powered by alkalines or interchangeable nicads, and all the ES units feature "power ratio control" for variable

manual output.

Sunpak's 311 is a modestly priced, fairly large ES unit with an ASA 25 GN of 40; it offers a choice of two working apertures on auto and its power ratio control goes down to 1/16 power (a four-stop range). Its maximum auto range is 20 feet. One feature the 311 doesn't offer is a tiltable head for bounce. For that, you'll need the 411, a new "system" unit with a cleverly designed head that will handle almost any bounce situation. The 411's GN is 50, it's got a five-stop power ratio control, and offers a choice of four working apertures on auto. Accessories include a remote sensor, 510-volt power pack, and various filters to change angular coverage and color balance.

Top of the Sunpak line is the 611, a pro-style handle-mount unit with a GN of 80. Maximum auto range is 40 feet, and the power-ratio control lets you go down to 1/128 power. Unlike most units, whose ready-light goes on when the capacitor has only reached 85% of full charge (which translates to half-stop underexposure), the 611's light will only glow when the capacitor is fully charged.

Jumping continents, let's turn to the West German Braun flash line. They've got a reputation for innovation, and have lived up to it recently by pioneering ES circuitry. The current line comprises two small manual-only units, three standard autos, and four ES autos—plus the very professional F900 two-piece handle-mount unit. All but one of the ES units is powered by noninterchangeable nicads. The others (except, of course for the F900) use AA-size alkalines. Every Braun unit covers the field of a 28-mm lens without accessories.

The two most powerful alkaline-using Braun units are the 28BC and the 28BVC. They've both got ASA 25 GNs of 46, and are functionally identical except that the 28BVC is an ES unit while the 28BC is a standard automatic. Both offer a choice of two working apertures and a maximum auto range of 16 feet. Neither has provision for bounce.

Braun's tilting-head units are all nicad-powered. The smallest is the 34VC, an ES unit with a GN of 56. It offers three working apertures, has a maximum auto range of 28 feet, and features a confidence light to check bounce exposures. Recharging time is 4½ hours. If that seems too long, you might like the 40VCR—it needs only one hour for full charging, has a tilting head, and



Konica C35EF has integral flash unit.



Two ways to keep contact: tape or Capro's clever "safety clip."



Sunpak 411 has versatile bounce head, offers system accessories.



Braun 34VC has tilting head, comes with charger for nicad batteries.



Metz Quadrolight units have "rotating foot" and swivel head for bounce control.



Minolta Electroflash 280 has flexible bounce head, smart styling.



Toshiba's ES-7 reveals another way to design a tilt-and-swivel unit.



Wein's WP500B is a genuine rarity, a low-cost but accurate flash meter.



This tilting gizmo (distributed by Kalt) lets you bounce on-camera—but not automatically—with a fixed-head flash.



Triple PC adapter is just the thing for feeding three sync wires into your camera.

offers a GN of 65.

Vivitar made a splash on the flash scene recently with their cleverly designed and highly popular 283 flash system. You'll find a detailed discussion of the 283 and two other system-type units farther on. But Vivitar also makes a number of non-system flash models. For example, there's the 253, a modestly priced and powered (ASA 25 GN of 35) non-ES, non-tilting automatic. Two working apertures are offered, and the maximum auto range is 18 feet. If jiggling four AA cells into proper place in a battery chamber takes more time and trouble than you like, you'll find the 253 of special interest: it's powered by a single, nine-volt, "transistor-type" alkaline cell.

Honeywell has long been a name to contend with in the flash market, and they're banking on their new "S" series to keep it that way. In the shoe-mount category, that means three energy-savers: the 280S, 380S, and 480S. The 280S is inexpensive and has one working aperture and a GN of 35. Powered by alkalines, it comes with a clip-on "diffuser" that is not really useful for bounce effects, unlike the "Strobodomes" for the 380S and 480S that kick enough light toward the ceiling to soften the effects of on-camera flash. The 380S and 480S are both powered by noninterchangeable nicads; full charge is achieved in three hours. Both offer three working apertures, and their guide numbers are 42 and 56, respectively.

Honeywell is also well-known for its pro-style handle-mount units, and I'll give you the dope on the newest "system-style" model 682S later.

Minolta is unique among major Japanese camera producers in having a complete flash line, ranging from manual minis through tilting and swiveling intermediates all the way to a pro-style handle-mount unit.

One of the nice things about Minolta flash units is that they have the look and "feel" we've learned to expect from premium-quality 35-mm SLRs, such as Minolta's own XK. The 280 Auto Electroflash is a good example. It packs a GN of 46, offers four working apertures, and has a nicely designed tilt-and-swivel head. It's energy-saving, and can be powered by alkalines or interchangeable nicads. Minolta's Auto 32 and 28 are less expensive, non-ES automatics with fewer working apertures but plenty of power (GNs of 52 and 46,

respectively) so that their tilting (but not swiveling) heads can bounce effectively.

Top of the Minolta line is the Electroflash 450. It's a handle-mount job with a GN of 74, provided you use lenses of 50-mm focal length and longer; a built-in diffuser expands coverage to that of a 24-mm lens, but with diffuser in place, the GN drops to 36. This model features ES circuitry, of course, and offers five working apertures plus what gets my vote as the nicest calculator dial in the business. You can attach a remote sensor and avail yourself of alkaline, nicad, or 510-volt battery power.

Germany's Metz has been known in this country chiefly for their "Quadrolights," large and heavy but powerful shoe-mount units that feature a side-swinging flash tube coupled with a rotatable shoe mount to give enormous bounce control. Noninterchangeable nicads supply the power, and the circuitry is ES. If you own a Nikon F2, the Quadrolight 218N is of special interest—it triggers that camera's built-in eyepiece ready-light.

The soon-to-be-introduced Metz 45CT-1 flash system may well push the redoubtable Quadrolights into the back seat. I couldn't get my hands on one before press time, but from the advance specs this looks like a very nicely thought-out system design. It's an ES handle-mount with a GN of 74, and a tilting head that also swivels completely around. The remote sensor features a variable acceptance angle and gives you a choice of nine (!) working apertures. A variety of power sources and filter-type attachments are available.

Toshiba's new ES-7 is an interesting tilt-and-swivel energy-saving entry from that well-known electronics manufacturer. It's got a GN of 51, uses alkalines, and offers three working apertures. The head tilts up to 90 degrees and the entire body (except the sensor module) swivels 180 degrees. Toshiba also makes the TM-1, a special underwater unit that should excite the scuba enthusiasts among you.

Hanimex recently has entered the flash sweepstakes with a modestly priced flash line. Leading the way are two nicely made tilt-head units, the BX550 and the CBX350. They're almost identical, except that the first is an ES unit and the second a standard automatic. Both use alkalines, offer two working apertures, and have a GN of 50.

Turning to flash equipment other than

light sources themselves, let's start with the most important one—at least if multiple flash is your thing. Back in the indoor section, I promised to steer you to a photographic rarity—an inexpensive flash meter. The one I had in mind is the Wein WP500B. Though nowhere near the construction quality of fancy pro flash meters, the 500B is more than accurate enough for most applications. For under \$60, it's an intriguing option for the studio-on-a-shoestring.

Wein also makes other relatively inexpensive electronic goodies you'll enjoy if flash exotica turns you on, such as a chronoscope (for stroboscope-like multiple exposures at a rate of from 1 to 30 per second) or a sound trigger (to catch that whiskey bottle the split-

second it hits the floor).

Flash brackets can be a godsend if your high-powered, heavy "shoe-mount" unit tugs a little too firmly on your accessory shoe. They also have an almost magical ability to make you look and feel important—the "official" photographer. And brackets with swiveling heads solve the annoying problem of not being able to ceiling-bounce with the flash on-camera when using a vertical format and a tilting but nonswiveling flash unit.

The only bracket advice I can give here is try a few on for size before you buy—brackets have different "feel" and features, and mate differently with various cameras and flash units.

If your flash head doesn't tilt, not to

mention swivel, can you still do on-camera bounce? Sure, if you work manually and get a "tilter" accessory that adds ball-and-socket flexibility to your accessory shoe.

Finally, a flash accessory that's saved my neck in countless flash situations: tape. Yes, tape. When I want to be sure that all those little, single-pin PC-type connections in a complex setup stay all hooked up and conducting the electricity that is the lifeblood of any flash system, I tape those contacts together. Quality tapes that leave little or no gummy residue are of course the only ones to use.

For names and addresses of suppliers mentioned in this article, see page 115.

Macro magic flash: pro-quality close-ups the easy way

If you follow the step-by-step instructions below *just once*, you'll have programmed a little manual flash to give proper macro flash exposures

"automatically," with nary a worry about figuring in flash-to-subject distance or the so-called "bellows extension" factor. It may seem like magic, but it's actually just an application of basic optical principles to the macro range (from about one-fifth life-size image on the film all the way to full 1:1 life-size).

(1) Get *automatic* extension tubes or, for highest quality, a macro lens.

(2) Use a small lightweight flash with an ASA 25 guide number of from 25 to 35. A manual-only unit is fine, or you can use a little automatic in its manual mode. A unit taking interchangeable batteries is far better here than one with built-in nicads; while you can always carry spare batteries, your a.c. outlet is unlikely to be handy when you're stalking the wild *Vorsithimus*.

(3) Choose a slow, fine-grain color slide film with an ASA rating under 100.

(4) Set your lens one-half stop wider than its smallest aperture (e.g., if your smallest aperture is f/16, set the lens half-way between f/11 and f/16).

(5) Take a piece of lens tissue and cover the flash head with it, using a rubber band to hold it in place (don't

worry, the rubber band won't cast any shadows). Now shoot your one and only "test roll" as follows.

(6) Find an average (meaning not too dark or bright) macro subject and shoot it at about one-half life-size, holding the flash *almost even with the front of the lens and angled in at your subject*. If you don't want to hold it with your hands, you can get a "Macroadapter" ring from Spiratone that screws into the lens and does the job for you.

(7) Repeat step (6) using two sheets of lens tissue, then using five sheets and finally using eight sheets.

(8) Finish the roll by repeating the above sequence for a few more typical subjects.

(9) Examine your processed film to find the number of sheets that gives the best exposures.

Now here's the pay-off: once you've calibrated your flash/film combination as above, *you can shoot at any magnification from one-fifth life-size all the way up to full life-size without ever changing anything*. (Of course, critical workers should bracket slightly with low-latitude transparency films.)

In effect, the manual unit is working like an automatic (strictly speaking, it's even better than an automatic, because you don't have to worry about lens-

extension factors). Why not start with the unit on automatic? Well, auto units generally don't work well at the close flash-to-subject distances characteristic of macro work. Even with those auto flashes that do work close-in, aiming the sensor so that it reads your subject is most difficult.

Remember that the above technique works only if your flash is up front near the lens, not sitting on your hot shoe. But don't go nuts trying to keep it in exactly the same place for every shot—as long as it's about even with the lens rim and aimed at the subject, results will be consistent.

If you're shooting at a little less magnification than 1:5, or if you're a bit beyond the other limit (i.e., shooting "larger than life"), you can compensate by *opening up* the lens by one-half to one full stop.

When you're holding the flash with one hand and the camera with the other, focusing by turning the lens ring isn't easy. Instead, focus by moving the entire flash/camera combination back and forth.

Finally, if you've got a little flash with variable manual output, you can use this control instead of lens tissue to calibrate your flash/film combination.

Continued overleaf

System flash: wave of the future?



Vivitar's 283 flash system.



Honeywell's 682S plus several accessories.



Ascort's Auto 1600 professional system.*

System flash—an application of 35-mm SLR design philosophy to flash units—is the hottest thing in the field today. It's no wonder; system units are versatile and fun to use—especially if you can afford a generous selection of the interchangeable goodies offered. But even if you're not that loaded, the "system" has a powerful allure—because you can always "move up" gradually to a more complex, sophisticated assemblage of equipment.

Here we'll take a look at three representative systems: Vivitar's 283, Honeywell's 682S, and Ascort's 1600.

The basic Vivitar 283 unit is a somewhat large, tilt-head (0–90 degree), shoe-mount ES flash with an ASA 25 guide number of 60. Its sensor is detachable, and a four-foot remote cord is standard equipment. A choice of four working apertures is offered, as well as all the little extras: confidence light, illuminated calculator dial, foot lock.

Like a number of other system flash units, the 283 lets you choose from four power sources: AA alkalines, interchangeable nicads, a 510-volt battery, and a.c. from your wall socket. But Vivitar's nicads are a little ahead of most of the competition: they go from exhaustion to full charge in 15 minutes. When you remember that less than a decade ago, 14-hour charge periods were the norm, you can see that nicads have come a long way. Unfortunately, you must pay a fairly stiff tariff for the accessory nicads and their charger—progress like this apparently doesn't come cheaply.

* (Just at press time, Ascort announced that the basic Auto 1600 unit is being replaced with an improved model Auto 1600 II. All accessories and components are said to be interchangeable between the two units.)

A number of electronic flash units over the years have offered accessory plastic

wide-angle "lenses" that spread out the light beam (and reduce the GN) for use with wide-angle optics. Vivitar has gone one step further—it also offers "lenses" for telephotos. Their big advantage is that they *boost* guide numbers (because they narrow the coverage). With a 135-mm or longer lens plus the appropriate flash attachment, the 283's ASA 25 guide number jumps to 87. The maximum auto operating range also jumps, from 43 feet to 62 feet.

A vari-power module (manual output control) for the 283 should be available by the time that you read this—it plugs into the socket normally occupied by the sensor. A variety of color filters, a grip, and a "soft light" bouncecard kit are also offered. This last item does soften somewhat the directionality of bare flash, but nobody has ever claimed that it's a substitute for an umbrella.

The basic Honeywell 682S is a handle-mount unit with an ASA 25 GN of 63. It's energy-saving, of course, but surprisingly offers only two working apertures—though using the accessory remote sensor boosts that number to three. It comes with a handy but non-tilting quick-release bracket and sports a confidence light and an easy-to-use calculator "slide."

The 682S can be powered by no less than five sources: six AA alkalines, interchangeable nicads, a.c., a 510-volt battery, and the Permacad Power Pak, Honeywell's own clip-it-to-your-belt nicad battery cluster. But your power options don't stop there. You can use two sources *in tandem*—and then the specs start to get really impressive. For example, recycling takes place in under 2½ seconds with the Permacad pack in tandem with alkalines—plus a range of 250 to more than 2,000 shots before exhaustion.

Front-end accessories for the 682S

come in the form of Strobodomies, half-egg-shaped diffusers that clip over the flash head. They're good for increasing angular coverage, softening direct flash, reducing light output, or adding color to your light, but they're not a replacement for bounce. If you want to use auto bounce with the 682S, you'll need both a remote sensor and tilting bracket.

The Ascortlight Auto 1600 is the most modular and versatile system currently available. Aimed at pros, it's a hefty handle-mount unit, made by folks who spend most of their time designing studio-style flash. The secret of the 1600's special versatility is that it's got a detachable flash head—a unique feature in the portable field. When you pull off the head, you can either place it remotely or replace it with a bare-bulb head, a ringlight, or even an infrared head.

The basic 1600 is an energy-saver with a GN of 80. It's got a squarish output pattern that covers a 28-mm lens on 35-mm cameras, and a 50-mm lens with 2¼-square cameras. The head swivels and tilts, and a choice of three working apertures is available. Power comes from interchangeable nicad modules, a.c., or a 510-volt battery. Both a remote sensor and a manual output adjustment module with a six-stop range are available.

What are ringlights and bare-bulb heads for? Well, a ringlight gives shadowless close-ups—it's great for shooting everything from stamps to dental work. A bare bulb is just that—a flashtube sans reflector. So it emits light in all directions, making it the only single-flash source suitable with fish-eyes. In a small room with bright walls, bare-bulb shots have a soft, bounced look; but outdoors, or in a large, dark room, a bare bulb is the harshest, most directional source there is.



BY BILL PIERCE

When Edward F. D'Arms, Jr., was awarded a National Endowment for the Arts grant, Nancy Hanks, head of the Endowment, held a press conference in D'Arms' hometown, Seattle. "What did you think of Mr. D'Arms' performance last night?" asked one of the reporters.

"You don't understand. The Mr. D'Arms that is receiving our grant is a photographer, not an actor," she replied.

"Didn't you see Richard the Second at the Seattle Rep last night? Mr. D'Arms played Bolingbroke."

"Oh, my, he was the best thing in the show!" she exclaimed.

That's the problem with Teddy. You can't pin him down. He doesn't move from career to career. He holds down several of them at the same time. At this very moment, he is

PLANES

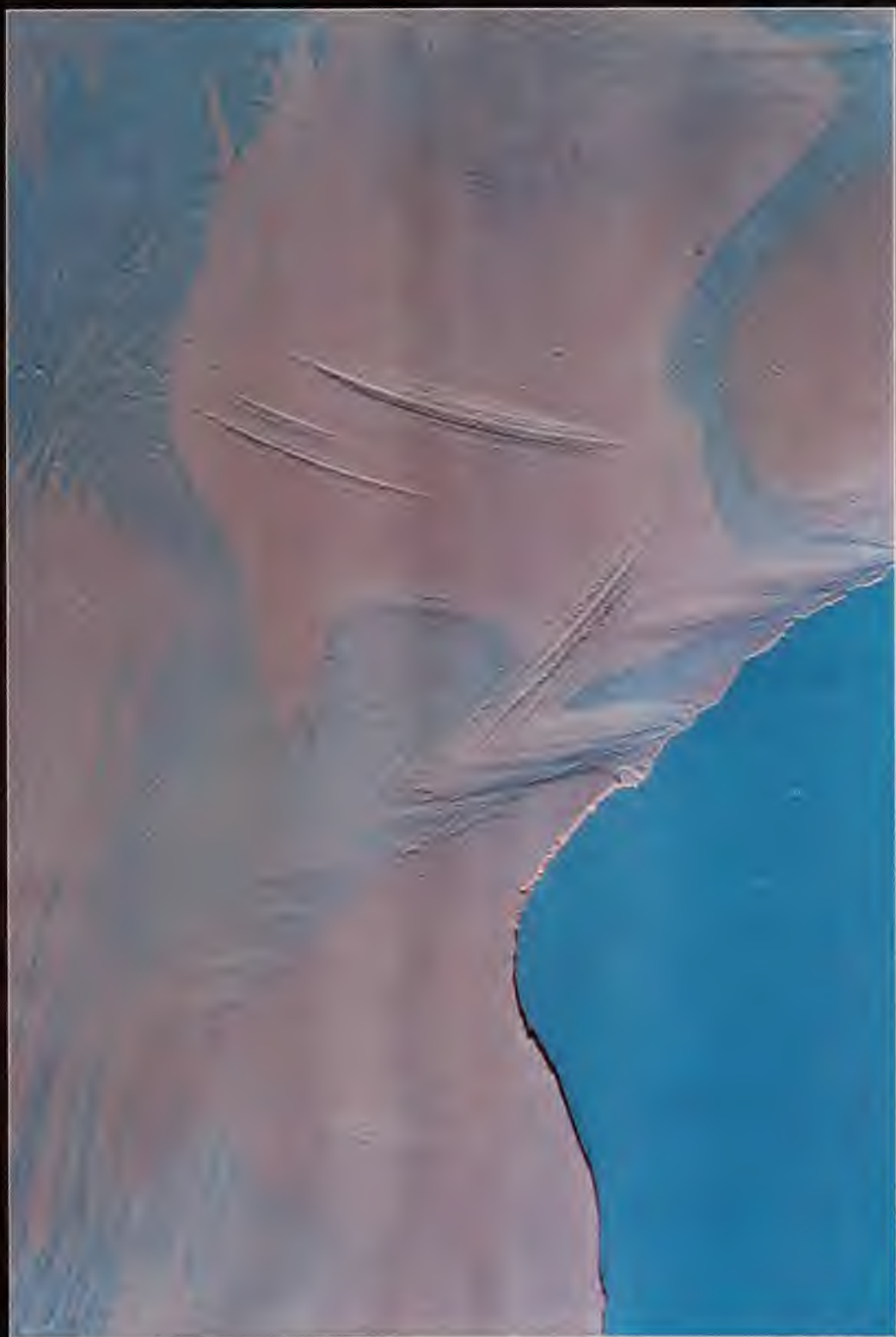
Photographs by Ted D'Arms

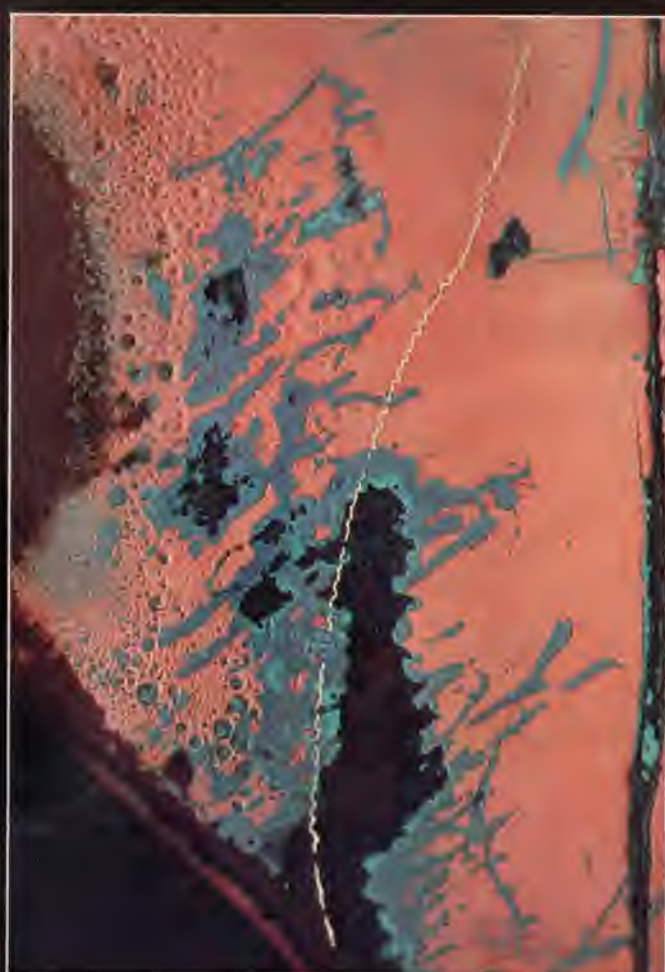
on location in the Skagit Valley in Washington, playing the lead in *Doubles*, a feature movie being filmed in the Pacific Northwest. The last time I saw him, a few months ago, he was in New York to attend

a gallery opening of his photographs.

There is not a lot of money in fine art photography; so most of Ted's financial base comes from his work in the theater. This in itself is far ranging. He trained as a singer until he was 21. When he came to New York in the '60s, he worked off-Broadway, Broadway, Lincoln Center, and network television as a dramatic actor. A professional actor can work in the Big City, but it's not always the best place to grow. There were, and still are, forays to the major regional theaters such as the Washington Arena, Houston Alley, and Hartford Stage to play Shaw, Shakespeare, Chekov,









Top, left to right:
macro shot of
paint-spattered
shipping container;
side of railroad car;
torn plastic wrappers
fallen on colored
artboard; side of
abandoned truck.

Bottom, left to right:
a D'Arms "paint form,"
found outdoors;
bottom of plastic
container for paint;
combination of dripping
paint, rust, and scratches,
found somewhere in Seattle;
corroding fender of truck.

Strindberg, or the contemporary playwrights that are too great a commercial risk for Broadway production. And there were, and still are, long forays to the outdoors and wilderness that he loves.

Finally, he did something that would be unthinkable to anyone simply pursuing a career in the theater. He moved to Seattle, Wash., the Olympic Peninsula, the Pacific Northwest, the Great Outdoors. He hasn't acted in New York since. You can see him on tiny amateur stages and the big silver screen. And in-between these extremes there are the Regionals, where top professionals can get together to do some of the finest work that is done in this country. On the commercial side, he does radio and TV you-know whats.

When Ted first came to New York, he owned an old Retina camera. He set up a darkroom in his bathroom and made pin money doing head shots of other young actors. But there was something very special and very personal about his photographs of the actors he worked with and admired. I still have a portrait of Peter Lorre that celebrates the great Brechtian actor of *M* and loves the older man who made all those Corman flicks. And then there are Ted's color images. The nature shots that he brought back from those forays outside the City. His discoveries, visions that all of us would have missed, made it clear why he loved that world. His loft-dwelling neighbors and friends, Lilo Raymond, Larry Shustak, Gene Smith, David Vestal, and others, respected his work. While he was an amateur who made little or no money from his photography and they were professionals (who made little or no money from their photography), he was an equal member of a group that exchanged ideas, advice, and support in the mutual hope that they would make it through the next month and be better photographers when they arrived there.

In spite of their variety, Ted's pictures have always been personal. Maybe this is because an actor draws upon himself to create his roles and Ted applies the same technique to his photographic work. For a television documentary on old age, he produced a series of black-and-white stills that were inserted throughout the movie footage. He has done promotional color for the Fort Lawton Indian Center. A series of black-and-whites were used in the successful fight to preserve an old market section of Seattle that was scheduled for demolition. These

are the obvious personal commitments of the documentarian or journalist.

In 1973, *Aperture* published a portfolio of studio close-ups of skeletons, shells, stones, etc., that Ted had accumulated in his wanderings. In his introduction, Ted says that the objects chose themselves. Well, someone was fascinated enough with the symmetrical beauty of a rabbit skull to take it home, to spend several months photographing it with different lenses and trying different exposure and development combinations until the final print caught what he saw in the object itself.

For one gallery show, Ted placed the strips of negatives from a single roll of 35-mm film in the glass carrier of an 8x10 enlarger and had a mural-sized contact sheet made. This was on one wall of the gallery. On the other walls were prints made from tiny sections of the individual frames. A clever intellectualization and strong presentation to hype the gallery goes? A clever concept, but no really good images? Here's the story: Ted was in a production of *Indians* in which the Indians were understudied by four black children. The theater felt that the parts should be understudied by Indians and the black kids were released from the cast. But first, a roll of film was taken in two or three minutes by Ted. Every frame shows four little black kids sitting in a dressing room, first posing for their friend, then mugging for their friend, then exploding with joy. That's the "contact sheet." The individual pictures are individual faces, gestures, etc. The pictures were taken as gifts for people that Teddy had come to like and probably wouldn't see anymore, some were memories for him, and some were presents to make them happy. When a gallery asked him to display some recent "good" pictures, they were what he exhibited. It was a strong show.

Teddy is serious, but often funny, too. For Valentine's Day he once made what can only be described as the world's most personal photograms. The rest is up to your imagination.

Ted acts, directs, teaches, lectures, writes, arranges exhibits of other photographers' work, is responsible for a large number of photographic lectures in the Seattle area, and defies being pigeonholed. Paul Strand once wrote Ted that no picture could be better than the life one leads, so he should lead a good life.



THE COLOR PRINTER'S BIBLE (Part IV)

All there is to know about color analyzers

By BOB NADLER

In the three previous installments of this series (35-MM PHOTOGRAPHY Summer 1976, Winter 1977, and Spring 1977), I have explored the theoretical basis of color photography, and also tried to deal with practical color printing in the simplest, most understandable (and hopefully least expensive) manner possible.

This time out, I'm going to wrestle with color analyzers, interesting devices that promise the ultimate in darkroom convenience—automatic exposure and filtration determination for color printing. Of course, these machines are not exactly inexpensive; also, as we will see, they require a *little* more from the user than the ability to push a button.

Principles of operation

Figure 1 represents a color analyzer reduced to the barest essentials and represented schematically. If your initial reaction to this sketch is, "Is that all there is?" I won't be a bit surprised. But essentially, that *is* all there is: four filter windows in a rotating turret, a light-sensitive cell, four potentiometers, a selector switch, a meter, and a battery.

The way this simple collection of hardware works is equally uncomplicated. The sketch shows the light-sensitive cell located under a solid portion of the filter turret, where it is shielded from the light falling on the turret from the enlarger lens. Now, if the turret is rotated clockwise, until the red-filter window is directly above the light-sensitive cell and directly below the enlarger lens, two things will happen: light from the enlarger will pass through the red filter and fall on the light-sensitive cell, and a mechanical linkage will turn the selector switch to its cyan

position. The cell will respond to the red light falling on it by changing its resistance. Current from the battery will be able to pass through the light-sensitive cell in proportion to the intensity of light reaching it. From the cell, the current will flow to a bank of four parallel potentiometers, then through a portion of the resistance element of the cyan pot, and through that pot's wiper to the wiper of the unit's selector switch set in its cyan position. From the switch the current flows to the galvanometer and causes the meter needle to deflect in proportion to the amount of current passing through the galvanometer coil.

When the filter turret is rotated to allow the enlarger's light to pass through the green-filtered window, the selector switch is automatically set to its magenta position and the meter deflection then noted is representative of the amount of green light hitting the light-sensitive cell. With the blue filter

positioned over the cell and the selector switch automatically turned to its yellow position, the meter indicates the blue content of the light striking the light-sensitive cell. Finally, when the clear-glass window is rotated into position over the cell, the selector switch is automatically set to read white light and the meter indicates the amount of white light that is striking the cell.

All of that is well and good, but of no use whatever for color printing purposes unless we can devise some scheme to put the information obtained from the meter to some use.

One way to do so is to use our simple machine to measure and record the properties of the light passing through a filter pack and a negative that we have previously used to make a perfect print. Then we can compare the properties of the light passing through another negative, which we have not yet printed, to these recorded values, and if we find that they do not match the perfect print's data, we can adjust the printing filter pack and lens opening until they do.

We can do that as follows: Use the normal procedures, described in the second installment of this series (35-MM PHOTOGRAPHY, Winter 1977), to make an *absolutely perfect* color print of your standard negative. When that's done, leave the enlarger set exactly as it was when the perfect exposure was made. Record the type of paper the perfect calibration print was made on, the paper's emulsion-batch number, the lens opening and duration of the exposure, the type of chemistry used to process the print, the processor used, the processing variables (there may be a dozen or more of these, which I will return to later), the age and condition of the chemistry, the type of film your standard negative was made on, and any other bit of data that you think may be even remotely pertinent to the way you produced the perfect print.

Once all that has been done, the analyzer can be positioned on the enlarging easel, in place of a sheet of printing paper. The standard negative is left in the carrier, all of the printing filters used remain in place, and the enlarger's head height and focus are left exactly as they were when the perfect exposure was made. The only difference between the enlarger setup used to make a perfect print and the one that will be used with the analyzer is that a diffusion filter is now placed in the enlarger's external filter holder and swung into position directly below the lens.

The room lights and any safelights are turned off and the enlarger lamp is

turned on. Now the light-sensitive cell is located on the easel directly below the center of the lens, and the analyzer's filter turret is rotated until the red filter is directly above the light-sensitive cell. The light from the enlarger lamp passes through the printing filter pack, the negative, and the lens, and is then integrated (thoroughly mixed) by the diffusion filter. This integration is required to insure that light coming from different portions of the negative receives the photographic equivalent of homogenizing, to average the color content of all areas of the standard negative. This is done to prevent a situation in which, for example, a patch of cyan on the negative might be the only portion of the image focused directly on the entire area of the light-sensitive cell. This, of course, would cause the cell to see only light considerably more deficient in red than in blue and green content. The diffuser serves to scramble the entire image and to mix light reflecting all of the color content of both the standard negative and the printing filter pack, to achieve an average integrated distribution of them over the surface of the light-sensitive cell.

With the turret set to allow only the red component of the light leaving the diffusion filter to hit the light-sensitive cell, and the selector switch automatically positioned to cyan, the meter needle will be deflected by the current flowing in the circuit. Now, if the wiper of the cyan pot is adjusted so that the meter needle is positioned exactly in the center of the scale, the analyzer will have been programmed for the red content of the scrambled light coming through your standard negative and through the printing filter pack you used to make a perfect print from it. This same programming procedure must also be carried out for each of the remaining three window positions on the filter turret. Each of the appropriate pot wipers must be adjusted until the analyzer is completely programmed, so that its meter needle will deflect to exactly the center of its scale on each of its four channels: cyan (red filter), magenta (green filter), yellow (blue filter), and white (no filter). Now, hopefully, we can put together this peculiar combination of hardware and color procedure and come up with something useful.

Let's now assume that you have another color negative, on the same type of film, and you would like to know what filter pack to use to print it. Of course, if you have read the preceding

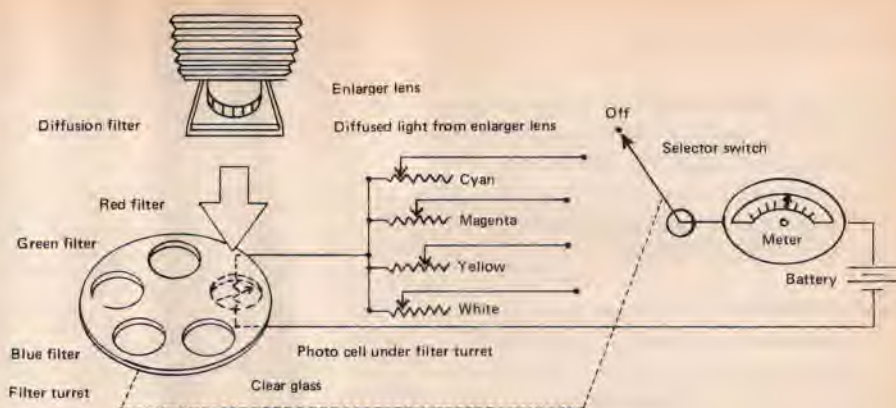


Fig. 1. Schematic of averaging, or integrating type analyzer.

installments of this series, you know that the most convenient, quick, and economical way to do this is by including the negative in a calibrated color contact sheet, but let's, for the sake of this example, go on and use this collection of electrical hardware to do the job instead. To do so, put the same printing filter pack you used to make your calibration print into the enlarger's filter drawer (or dial in the appropriate dichroic filters). Close your enlarger lens down two stops from wide open. Crank the enlarger head up or down to get the magnification you want. Put the unknown negative in the carrier. Compose and focus the image to be printed on the easel, then put the analyzer's filter turret on the easel. Swing the diffuser in under the lens. Now rotate the turret until the red filter window is over the light-sensitive cell. Note the position of the meter needle. If it is not at the mid-point of the meter, there is a difference between the amount of red light that is falling on the light-sensitive cell with the unknown negative in the carrier, and the amount that was measured as having passed through the standard negative. Cancel out this difference by opening or closing the enlarger lens diaphragm until the meter needle settles at its mid-position. Now you go through a very similar procedure with the green and blue filter positions on the turret, but for these readings you don't center the needle by adjusting the lens opening. Instead you add or subtract magenta filtration from the printing filter pack to center the needle when the green filter is in the light path, and you center the needle by changing the yellow component of the printing filter pack when the blue filter is lined up with the light-sensitive cell. Now you have used the analyzer to insure that the printing paper you expose will get the same proportions of red, green, and blue light that your calibration print

of your standard negative did. All that now remains to be done is to adjust the overall level of exposure. To do this, rotate the filter turret until the window holding the piece of clear glass lines up with the light-sensitive cell. Then turn the enlarger lamp on, and with the diffuser in place, note the position of the meter needle. If it is not at the center, bring it to that position by opening or closing the lens diaphragm.

Now, in theory, you have completely matched the color content and intensity of the light coming through the unknown negative to that which you found would, when it came through your standard negative, produce a perfect print. Since the unknown negative is on the same type of film (and therefore has the same type of built-in printing mask), and you have painstakingly matched its projected image characteristics to those of your standard negative, all you should have to do now is remove the analyzer from your easel, put another sheet of the same kind of printing paper that you used to make your calibration print on the easel, expose the paper for the same length of time you used for the calibration print, remove the exposed sheet, process it exactly the way you did your calibration print and, lo and behold, you *should* have a perfect print of your unknown negative. The odds are, though, that you won't. There are just too many things that can happen to foul up our simple little analyzer and its comparative reading.

And even if the simple little device that I have used for illustrative purposes did manage to do its job faultlessly, a slight change in any one of the myriad of possible variables would be enough to cause the print made on the basis of our instrument's readout to be considerably less than perfect.

Much of the remainder of this installment is devoted to defining and describing the many problems inherent

in the use of electronic color analyzers in color printing, and to examining some of the many refinements that have been incorporated into today's commercially available instruments in efforts to overcome these problems.

Analyzer types

Perhaps the most obvious thing that may have occurred to you as a definite limitation of my hypothetical little analyzer is its need to operate with a diffuser in the light path. I've scored this limitation earlier in the series (Summer 1976) where it applied to the cheaper and simpler passive color-printing calculators. My reasons for disliking the use of a diffuser, to scramble and integrate the color content of an "average" focused color image, was simply that there really isn't any such thing as an average image. That objection is just as valid here.

The little color analyzer I've illustrated and discussed so far has been based on the assumption that every color negative that you may ever want to analyze will have the same "average" color content as your standard negative. This is a statistically valid but often specifically incorrect assumption. A standard negative is always chosen for its *average* properties. It is shot with an eye toward a good, even distribution of color content. A negative containing an image of your Uncle Irving seated in his fire-engine-red Chevy is certainly not going to have the same sort of "average" color content.

If you try to analyze the shot of Uncle Irv with the little machine we've been using, you will run into a problem called subject failure, caused by a predominance of one color in the image. There is an obvious way around this problem: let's develop a type of color analyzer other than the averaging, or "integrating," type we have been discussing until now. The quickest way to do this is simply to remove the diffusion filter from the schematic, as is shown in Figure 2. Now the turret's filter windows will admit a small and specific portion of the focused image to the surface of the light-sensitive cell. Since the filter windows in the turret shown are fairly large, such a metering scheme would be referred to as a zone type. A machine of this type would probably prove to have very limited use; there are very few large areas, or zones, of a single uniform color in the vast majority of color negatives. But with the diffuser

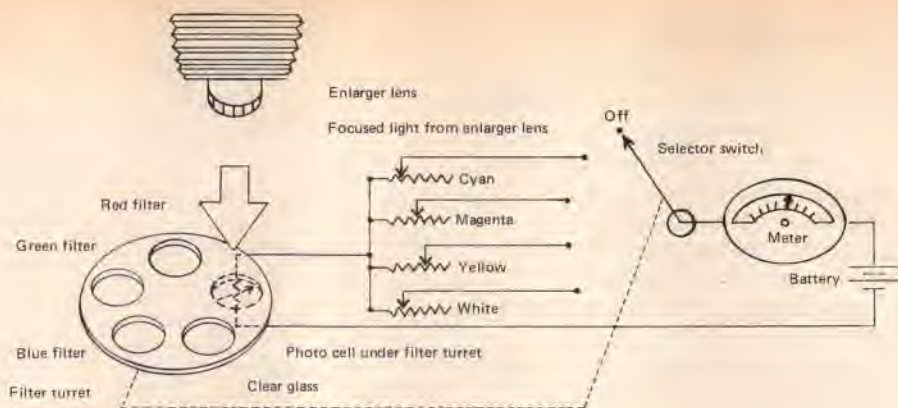


Fig. 2. "Zone-type" color analyzer (diffusion filter has been removed).

removed from the light path, it is just such uniform, monochromatic areas of the negative that will concern us as we are programming our newly modified, zone-type, electronic color analyzer.

For now, let's ignore the question of practicality and see how a zone-metering type of analyzer could be programmed to be more useful than an averaging-type meter. Let's assume that you shoot a lot of landscape material, and that you do much of your shooting during the summer when a lot of the landscape is of a fairly uniform color. You can use a typical landscape negative as your programming standard. First, of course, you'll have to make a perfect print of the negative, using our good old tried-and-true methods from the earlier installments of this series. Then record the data used to make the perfect, calibrated landscape print. Leave the enlarger set up with the landscape standard negative in the carrier, and with the same printing filter pack and mechanical settings that were used to make the calibration print. You can now position our little zone-type analyzer's filter turret so that the area of the standard negative's focused image that falls on the filter windows will be from an "average" portion of the green foliage of your landscape image. The entire programming procedure would then be run through, as before, to put an "average-green-foliage" program into the machine. Then every shot, on the same negative material, containing a landscape with a lot of "average" green foliage, can be set up in the enlarger so that the analyzer turret's filter windows look at the projected image of some of that "average" green foliage. The filter pack and the enlarger lens can then be adjusted so that the unknown negative's "average" foliage will be printed with light having the same color components and intensity as was used to make your perfect calibration print of the standard

landscape negative.

Now, we all should know full well that there is no such thing as "average" green foliage but, nevertheless, this sort of procedure is recommended for use with several zone-type electronic analyzers available today. If you are willing to buy the premise, you may well be willing to buy the machine.

The next level of refinement we might wish to make to the basic analyzer, shown in Figure 3, is simply to close down the size of the windows in the filter turret to four very tiny holes. If we do this, we won't have to look for a relatively large zone of a single, uniform, programmable color in the projected image. Instead, we can look for a much-easier-to-find tiny spot of such color. This, then, is the basis of a spot-reading electronic analyzer. But it should immediately be obvious that if you close down the filter windows you will also limit the amount of light that can fall on the light-sensitive cell, regardless of the sensitive area of that cell. So one of the first problems we will have to overcome in the design of this new, spot-metering-type analyzer is that of light sensitivity. For our purposes here, overcoming that problem is quite simple. We can simply put an amplifier in the circuit to boost the output of the light-sensitive cell. In the real world of nuts and bolts and transistors, the solution may be a good deal more complicated, but we needn't worry too much about the real world here, except to mention that the more sensitive such analyzer designs become, the less inherent circuit stability they tend to have.

Now that we have our little analyzer boosted in power to the point where it can measure the intensity of the light passing through a tiny hole that is covered with a very dense, additive-primary filter, we can go about our programming and our unknown-negative analysis a bit more selectively. For one

Interesting devices that promise the ultimate in darkroom convenience—automatic exposure and filtration determination for color printing.

thing, we can go back to using our normal standard negative to generate a perfect calibrated print, once again by the methods outlined earlier in this series, and then use the standard negative, and the enlarger setup used to make it, to generate not one but several programs. For example, we can place the analyzer's tiny light-measuring spot on an area of the focused image that contains only an evenly lit 18%-gray card and set a program into the analyzer for 18%-gray cards—always a very useful kind of program to have in any kind of machine, I might add. Or we can place our sensitive spot so that it is directly under the projected image of a middle tone on a uniformly lit, female, caucasian face, and put a middle-white-skin-tone program into our analyzer. Or we can put the spot under the projected image of an area of the negative containing one of the color bars that are such valuable components of any standard negative. Then we can put a program into our spot-reading color analyzer that will allow you to compare any such color bar in any future unprinted negative to the information stored in the analyzer's pots, and thereby set your enlarger up to produce a print that will have a perfectly rendered color bar. There is no limit to the number

of programs you can set up with a spot-reading analyzer, although I doubt the real usefulness of all of them about as much as I do the simple averaging program we set up in this installment's very first example. They will, at the very least, allow you to do a bit of cross-checking when analyzing any given negative.

But there is a very large fly in the ointment here. So far I have only provided you with a hypothetical machine that can hold only a single, fixed program. On the analyzer we have been using until now, you set the program into the machine by making four separate adjustments to four separate potentiometers. I haven't told you how you can use this machine with more than a single program at a time. I'll do that right now so that I can end this section and get to more exciting stuff.

In addition to not telling you how to deal with multiple programs, I never told you how you would manage to set the pots. While I have used at least one commercially available electronic color analyzer that required me to set its multi-turn pots with a screwdriver, most such machinery provides the user with a simple knob for adjusting each of the pots employed in the circuit. And most such units provide an index line on each knob and a scale surrounding each knob, so that the pot settings can be noted and recorded on paper. Now, through the magic of the printed word, I will similarly equip my little hypothetical electronic color analyzer with such knobs with index lines and with such logging scales. With a machine so equipped, you might go through the 18%-gray-card spot programming procedure and find that the cyan pot knob's index line pointed to 17 on its logging scale, the magenta pot knob's index pointed to 1.5 on its scale, the yellow pot knob's index was set at 44.3 on its scale, and the white pot knob's

index pointed at 7 on its logging scale. If I carefully note each of these knob settings, I can then move the sensitive spot on the turret over a bit to look at, let's say, the middle-white-skin-tone portion of the image. Then I can set a middle-white-skin-tone program into my machine without any concern for the fact that I am moving the pot's knobs off the settings I had so painstakingly established when programming the machine for 18% gray. I can twist the knobs with abandon because I have written each knob's index position down in my lab record book, and can quickly re-establish my 18%-gray-card program simply by looking up the recorded data and resetting the knob's index lines to the logging scale positions they had been at when I first loaded the program into the machine.

I can do this with a degree of accuracy and repeatability that will be a function of the quality of the pots I use in my analyzer. If I use cheap pots with coarse windings, I will find it very difficult to get exactly the same program re-established in the machine, because the slightest movement of the knob will cause a large electrical difference to be introduced into the circuit. Obviously then, since this is only a paper design that I don't have to sell at an attractive price, I will use only the very finest multi-turn, zero-backlash-gear-driven, digital-readout-knob-type pots in my analyzer. Unfortunately, few, if any, manufacturers of real products can afford to follow my example.

Analyzer features

There are a large number of electronic color analyzers on the market, at a wide variety of prices, offering a number of different features that their makers advise are of paramount importance to users. I'll do my best to explain some of them here, using my hypothetical little electronic color analyzer, whenever possible, to simplify matters. However, the reader should always be aware that the real product hardly resembles the crude little device that I have used for illustrative purposes. The real machines are complex, both mechanically and electronically, and they are, in many cases, rather good examples of contemporary solid-state technology. My continued reference here to my simple machine is aimed at helping those readers who are not comfortable with the complexities of the actual devices.

Sensors

You have probably noticed that my

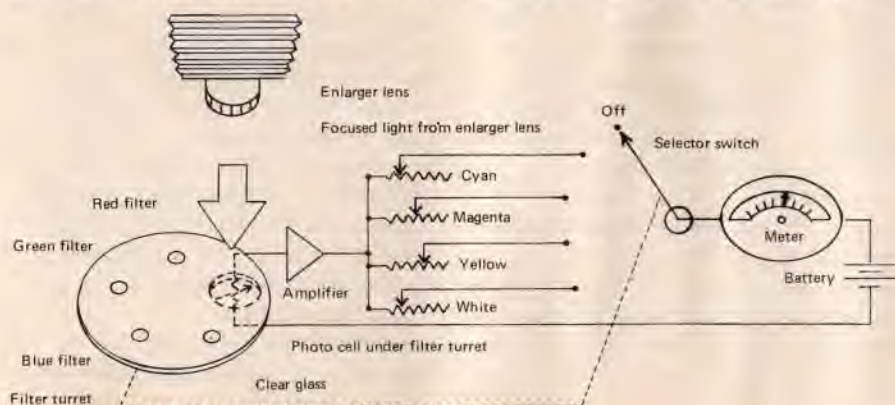


Fig. 3. Spot-reading electronic color analyzer.

analyzer has a sensor I have continually referred to as a "light-sensitive cell," without bothering to define it further. Real-analyzer designers have to get a little more specific. They can incorporate light-sensitive cells of three different types: cadmium sulfide (CdS) cells, photodiodes, and photomultiplier tubes. I've listed the sensors in ascending order of their light sensitivity.

The CdS cell has long been familiar to users of 35-mm SLRs with behind-the-lens meters; the same type of cell is used in many such metering systems. CdS cells have the advantages of reasonably good sensitivity, high stability, and low cost, but they also suffer from a tendency to go "blind." The term "blind" refers to a peculiar phenomenon that causes a CdS cell to provide incorrect response to light stimulation for a considerable period after the cell has been exposed to very bright light.

Unfortunately, it is all too easy to blind the sensor of an electronic analyzer by inadvertently turning on the normal room lights in the darkroom while the analyzer is in use. To compensate for the relatively low sensitivity of CdS cells, the manufacturers of several electronic color analyzers locate such cells directly under, and adjacent to, the enlarger lens, in probes that are held in place by special brackets that attach directly to the enlarger or to the lens barrel itself. CdS cells are generally employed in integrated-light-reading-type analyzers.

Photodiodes are the latest sensors to be used in electronic color analyzers, and like the CdS cells, are also familiar to users of 35-mm SLRs. Silicone photodiodes are now beginning to be used widely in such cameras' metering systems. These cells offer a virtual immunity to blinding and a considerably faster response time than do CdS cells. They can also provide much greater sensitivity than the CdS cells can, but to do so, they require considerably more sophisticated circuitry, and so may be regarded as very much less stable than CdS cells. With enough clever, high-quality circuitry, however, this nasty tendency can be overcome completely. To the best of my knowledge, the only commercially available electronic color analyzers that employ these cells are the Minolta and the Cosar Mornick 328 Chrona Log. The Minolta analyzer is designed to operate only in conjunction with a special enlarger, also of Minolta's

manufacture, which locates its light-sensitive silicon photodiodes within the bellows of the enlarger itself. I expect to see wider use made of photodiodes in other electronic analyzers in the not-too-distant future.

The most sensitive but least inherently stable of the several light-sensing devices used in electronic color analyzers is the photomultiplier tube. This vacuum-tube sensor is useful down to incredibly low levels of illumination, but it is also very easy to overload ("blind") unless elaborate circuitry is employed to protect it. At the present state of color analyzer technology, photomultiplier tubes are the units of choice for spot-reading designs, primarily because of their extreme sensitivity. Like all vacuum-tube devices, the photomultiplier tube is subject to damage from rough handling.

Probes

The filter turret of my hypothetical analyzer is part of its probe. In the real world, probes are usually neatly packaged and a good deal more sophisticated. Probes fall into two broad categories: on-easel and off-easel. The type of probe that is placed on the enlarger's baseboard or is mounted by a special bracket in a position immediately below and adjacent to the enlarger lens is obviously in the off-easel category. The type of probe that sits directly on the easel is a member of the on-easel category.

The typical probe is connected to the main cabinet of its associated electronic analyzer by an electrical cable of sufficient length to permit the user a bit of flexibility in placing the cabinet. However, not all connecting cables contain electrical wires. Some analyzers locate only the filter windows in their probes, and use fiber-optic bundles to transmit photons rather than electrons back to the cabinet. An advantage in using such a light pipe with an analyzer employing a photomultiplier tube is that the sensitive vacuum tube itself can be kept within the unit's cabinet and so offered a high degree of mechanical protection. Then, on the other hand, the difficulties and inconsistencies encountered with some fiber-optic devices may well offset that advantage. I won't try to judge the question.

It is very important that the user of any color analyzer be aware of how the probe for the particular unit is designed. The most common design calls for the probe to be placed flat on the surface of the printing easel. Other probes are

designed to be placed on the surface of a piece of printing paper of the type that will subsequently be exposed. Still other probes may be calibrated for placement on the enlarger's baseboard or for placement at some very specific distance from the enlarging lens's front element. In general, you should be aware of exactly how your particular probe is intended to be used, as a deviation of only a few millimeters from this specific placement can influence the instrument's readings.

One probe feature allows for obtaining a partial-reading correction when the probe must be placed well off the enlarger's optical axis in order to locate it on some specific spot. To achieve this partial correction, often referred to as "cosine correction," the light-sensitive receptor can be tilted to receive light rays from the enlarger lens at an angle more nearly perpendicular to the surface of the receptor than if no tilting were possible. However, if this mechanical reorienting of the probe is not accompanied by any electrical compensation to the circuit for the increased light-path length, actually only a partial cosine correction is achieved.

Packaging and components

All of the many component parts that are housed beneath the metal skin of an electronic analyzer's cabinet contribute directly both to the instrument's accuracy and to its convenience of use.

You may have wondered, when I mentioned earlier that in order to program or to analyze with my device you would have to turn off all room lights and safelights, just how were you going to be able to see the meter needle in the dark to carry out the necessary procedure? The answer, very simply, is that you wouldn't be able to see the meter, unless of course I had been smart enough to put a little light bulb into the meter case itself, to light up the dial whenever the filter turret, and therefore the selector switch, was turned to a reading position. Any color analyzer that employs a meter readout must provide for meter illumination. Your own eyes will have to determine whether the units you are considering offer enough of it to suit your needs. And no matter how brightly it is lit, the meter face on any analyzer you are to use comfortably will have to be large enough physically so that you can read it with ease.

Illumination of the machine's operating controls can also make the difference between a clumsy, hard-to-use instrument and one that simplifies

Four filter windows in a rotating turret, a light-sensitive cell, four potentiometers, a selector switch, a meter, and a battery—that's all there is.

your darkroom procedure. Such things as probe-channel selectors, pot-knob scales, and power switches can all be very difficult to deal with in the dark, unless you are somehow able to find them and then see enough of what you have to do with them to make the task possible.

Back on the subject of meters, it is important to note that even the largest of them, when viewed in bright room light, can be very difficult to read without parallax error, the inaccuracy often encountered when viewing a thin meter needle from an angle rather than looking at it from a position directly in front of, and perpendicular to, the needle. A mirrored meter scale can help to overcome this problem, but a direct digital readout is even more foolproof. Some electronic analyzers use lights, instead of meters, as indicators. Obviously this type of readout is very easy to use in the dark, but the amount of information conveyed by such a system may be very limited.

You may also have wondered, while I was describing the negative-analyzing procedure used with my simple machine, what would happen if you ran out of lens openings while you were trying to bring the meter needle to its center position by adjusting the lens aperture. Clever devil that I am, I simply failed to mention that there was a rather good possibility of doing just that, particularly with under- or overexposed negatives. In the case of my machine, you would have to be smart enough to change the enlarger's head height and calculate the effect of the light-path change in f-stops. Fortunately, however, most contemporary electronic color analyzers don't require you to be that smart. They provide some type of

sensitivity-range extension, either through a mechanical change in the size of the aperture over the light-sensitive cell, by means of electrical switching, or by indication on the meter scale. This sensitivity-range extension capability is often an important feature and one that should be looked for when selecting an instrument.

While discussing my simple analyzer, there was hardly any need to consider the type of circuitry involved, as there was virtually no circuitry involved. But the cabinets of most electronic analyzers on the market are packed full of electronic components. Perhaps the best of these designs are entirely solid state (with the exception of the photomultiplier tube, where used). In general, defective solid-state components can be expected to burn out quickly once the unit is turned on; if they are satisfactory, they'll last for a reasonably long time. This will generally tend to keep solid-state component failures well within the time limits of the unit's warranty. All solid-state circuits also have the advantage of being available for operation as soon as the power switch is thrown. Vacuum-tube units must be allowed to warm up and stabilize before they can be used.

While on the subject of stability, it should be mentioned that circuit stability is not simply a matter of whether the components are solid state or not, but, more largely, a matter of how well the components have been used in properly engineered circuits. The best of transistors and IC chips can be improperly applied in circuits that are inherently unstable. Any electronic analyzer that shows pronounced signs of meter-needle drift under steady-state conditions will be all but unusable in the darkroom. Part of the way that circuit stability is achieved, in this era of electrical-power brown-outs and overloaded household circuits, is through the provision of voltage stabilization at the instrument's input. This is a very important feature that should be looked for in any unit under consideration. A *minimum* of $\pm 1\%$ regulation for $\pm 10\%$ line variation is desirable. If more is provided, all the better. Sad to say, however, that unless your enlarger is also provided with input voltage stabilization, your very stable analyzer is often going to give you some very irrelevant readings. If you can afford to spend the amount of money required to buy a voltage-stabilized electronic analyzer, you would be well advised also to buy a constant-voltage transformer to

power your enlarger. In case this discussion of input voltage stabilization has confused you, you might look back to one of the drawings of my little analyzer circuit. You will note that it is powered by a battery. It should be apparent that if that battery voltage drops, so will the meter readings. If the voltage can be stabilized, all other settings being equal, the meter reading will also remain constant. In the real world of most electronic color analyzers, the power source is not a battery, but rather the 110 volts of a.c. that comes out of your darkroom's wall outlet; this too has its ups and downs and needs to be stabilized.

If you will forgive me for repeating myself, I do want to mention once again that the accuracy and repeatability of programming with any instrument will depend, to a very large extent, on the quality of its programming pots and the accuracy and legibility of the pot dial-face indexes. You might want to try setting up a random program, then changing the pot settings, and then trying to reestablish the program a few times. Note the ease, and particularly the accuracy, with which this can be done, when considering an instrument for purchase.

One very useful feature in any analyzer is built-in electrical-program storage. This feature is, essentially, fairly inexpensive to build into a circuit, simply requiring three or four additional pots and one additional position on a multi-position selector switch per program to be stored. As I will explain later on, creating and storing multiple programs is a virtual necessity for most electronic color analyzer operators. There is nothing inherently wrong with storing programs in writing on a piece of paper, as we had to do with my little machine, but it does always involve the unavoidable inaccuracies that are encountered when trying to reestablish programs on an instrument. Among units intended primarily for the amateur market, the Beseler PM2 is the only electronic color analyzer I am aware of that has a built-in capacity to store a total of three programs. One analyzer, the EPOI MM-9, offers plug-in program storage modules.

Benefits and limitations

The primary benefit an electronic analyzer can bestow on a darkroom worker is speed. If you understand the instrument's limitations and can accommodate yourself to them, an electronic analyzer will save you a lot of

NEW MEXICO'S CRAZY TALK, WE ALL KNOW THAT. BUT THERE ARE PARTLY CRAZY GUYS, AND THERE YOU'VE BEEN BLOWN UP A COUPLE TIMES. THE FEELING IS DIMINISHED. IT'S HARD TO BE FOR AN X-BOX, BUT HERE IN NEW MEXICO PLINY OF MEN HAVE DIED FOR THE LAND, OR BEEN KILLED FOR IT, AND PLINY HAVE BEEN READY TO DIE FOR IT IN THE FUTURE. LAND IS STABLE AND DESTROYED.

I CAME OUT HERE IN 69 I THINK SO LONG AGO IT SEEMS I HARDLY CAN RECALL. I CAME OUT HERE WITH THIS WOMAN STEPHANIE, A PAINTER. WE LEFT MOST OF FRIENDS BACK BEHIND, US IN NEW YORK, AND WE CAME HERE TO SANDOZ COUNTY NEW MEXICO, PRETTIEST LITTLE PATCH OF SAND IN THE WORLD. NOW IT IS HOME. WE BUILT A HOUSE AND HAD SOME KIDS, BACK IN NEW YORK EVERYONE WAS DYING. I MET A MAN FROM MEXICO, EDDIE HE SAID HIS NAME WAS. HE TAUGHT ME TO SMOKE.

WHO ARE WE AND WHERE DO WE COME FROM? WE ARE THE CHILDREN OF KEROUAC. WE HAVE COME FROM EUROPE AND THE EAST, TO DWELL IN THE LAND OF SO CALLED ENCHANTMENT. AND WHO CAME BEFORE US? WHO'S LAND?



STEPHANIE 1969

IS THIS IN WHICH WE PASS? WHO BUILT THESE HOUSES? WHO LEFT THESE BONDS? ZUNI'S, APACHES, SPANIARDS, MEXICANS, TEXANS, THEY HAVE ALL COME HERE AND SPILLED THEIR BLOOD AND OTHER'S. NO LOSS TO THE DESERT. IT WILL BE DESERT LONG AFTER WE HAVE GONE.

LOWKEY SPANISH, TO BUILD HOUSES AND TO LOVE EVERYTHING FROM CALIFORNIA SOUTH. BEING MEXICO OR "WEST" AS THEY SAY IN DENVER, I LEARNED HOW TO STAY IN THE BORDER. EDDIE INTO AMERICA EACH SPRING, AND I LEARNED TO HAVE (NOTHING PERSONAL) THE BORDER. PERSONALLY, I THINK WE'D BE BETTER OFF WITHOUT THE BORDER, CERTAINLY, WITHOUT THE BORDER PORCH, BUT I DON'T MEXICO WOULD EVER GO FOR IT. SEE THAT MOUNTAIN BACK THERE? ITS CALLED SANDIA WHICH MEANS WATERMELON AND ITS FILLED WITH HYDROGEN BOMBS. THERE'S A BUILDING OF BOMBY BOYS FROM NAM OUT HERE, BOYS THAT WERE BLOWN APART IN NAM WHO WANT TO TAKE THAT MOUNTAIN, THAT WANT TO TAKE ALB. WHO WANT TO TAKE WASHINGTON AND LIKE NUT TURNER IN HIS SUMMER, THINK THEY'LL BE SAFE THERE, NEVER TO BE DISOBEY.

BY COMPARE SCHOLARS. MEN WITH SMALL MINDS AND NO HEARTS HAVE TOO MUCH LAND AND TOO MUCH MUCK PAPER. BUT ITS ALL ON PAPER. MEN WITH LARG HEARTS AND NEED PAPER WERE HYPERBOLICALLY AS TAILOR CARS, SUBMISSIVE AND GIVE CARS EVEN LOW, WHILE THEY ARE NOT LEFT AND HERE FOR BOMBS. BOMBS TORE CARS WHEN YOU GIVE THEM A BOMBING GAME. THE MILLION MEXICANS ARE HERE, GOOD CITIZENS WHETHER YOU COUNT THEM OR NOT THEY COME HERE FOR WORK. WHO DO YOU SUPPOSE THEIR CHILDREN WILL COME FOR?

Borderlines

A PORTFOLIO BY DANNY LYON

Would you believe that the photographer who gave us such searing documents as *The Destruction of Lower Manhattan*, *Bikeriders*, and *Conversations with the Dead* is now using Magic Markers to create wildly colored borders for his black-and-white prints? Yes, these are Danny Lyon pictures, right down to the strange borders full of yellow dots and purple bars and scattered red words that catch our attention and direct it to the subtlety within. But there's more to the process than mere trick framing. Lyon lives

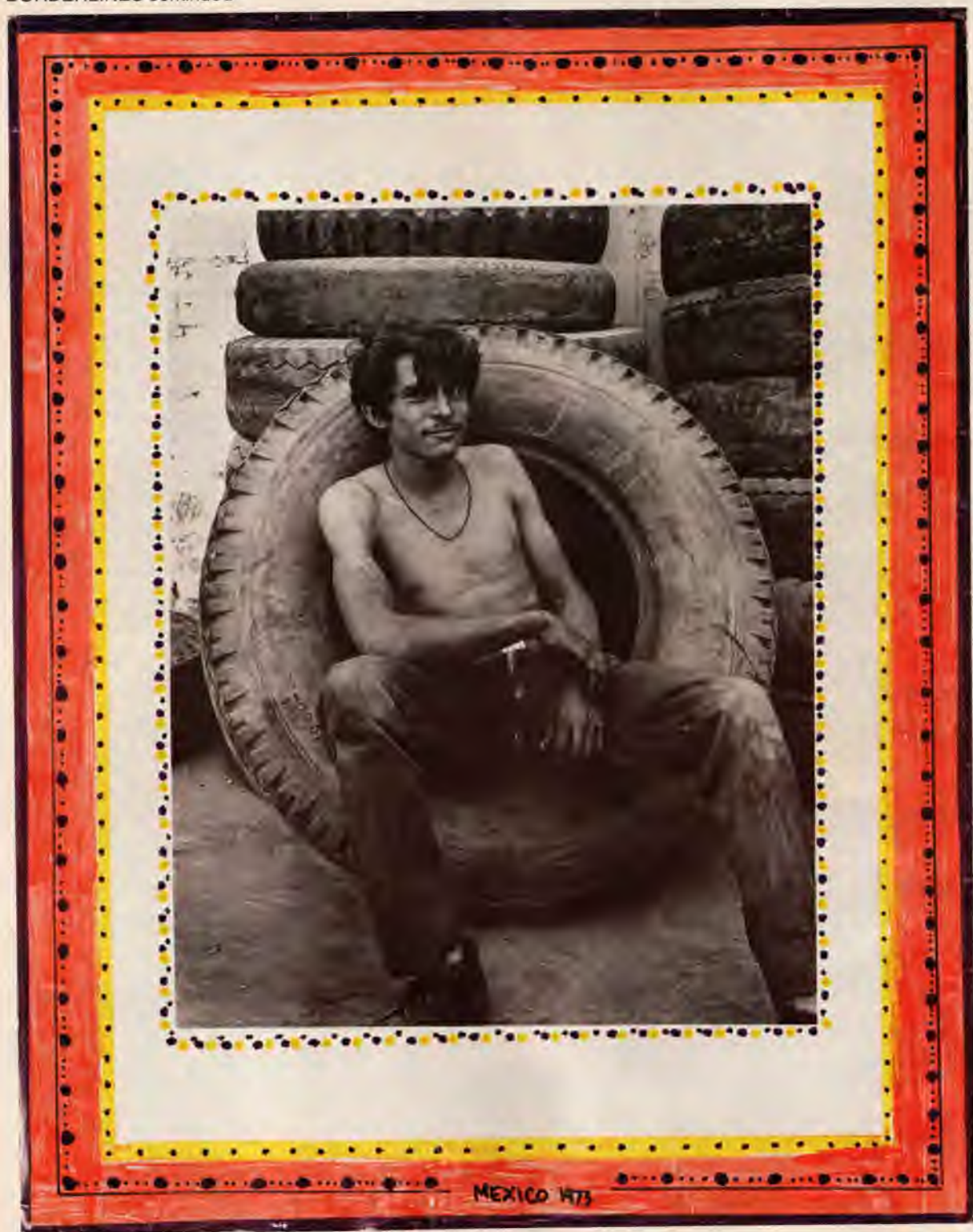
in the Southwest; for several years, he has been documenting the people who carve their lives out of deserts and other hot and dry spaces. His borderlines are a further attempt to deal with a real environment within the limitations of a two-dimensional paper image; he uses strange colors and shapes to suggest heat, tension, visual imbalance . . . and certain other concepts that both photographer and viewer have yet to define. Lyon is attempting to expand vision rather than confine it.





CHIHUAHUA, MEX. 1972

BORDERLINES *continued*





L.A. 1938

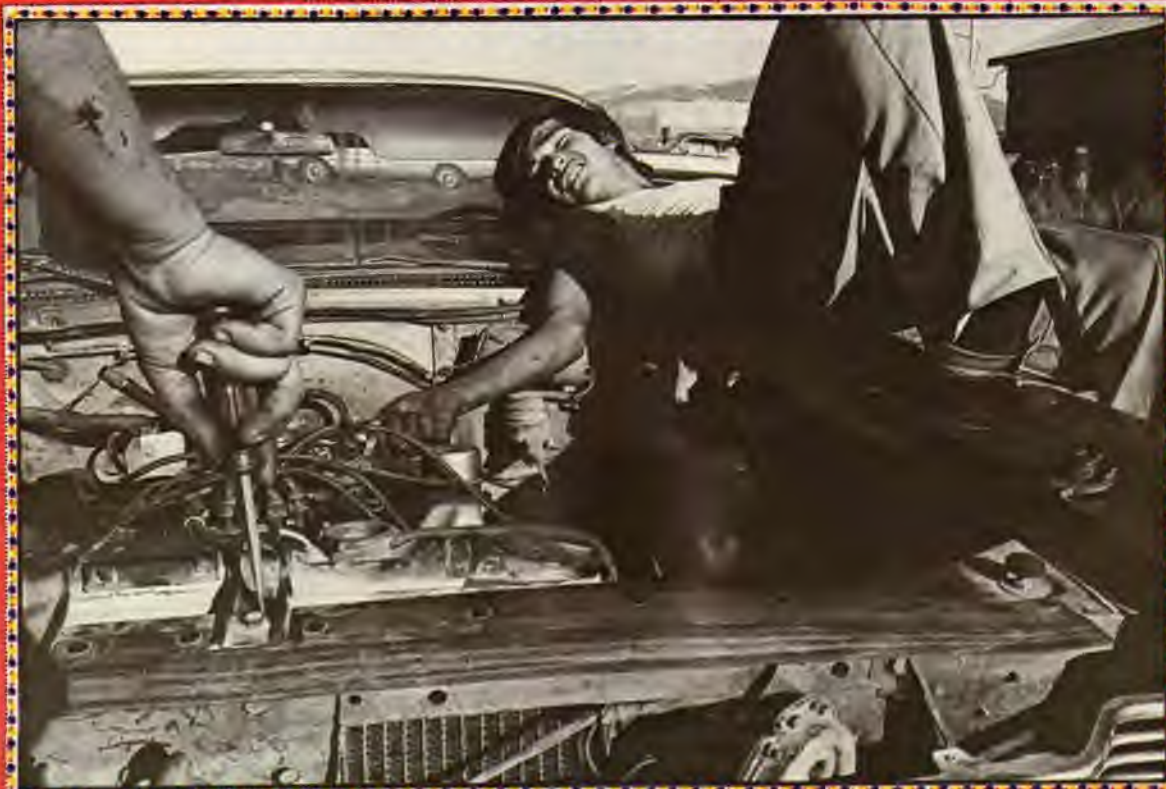


MARY THE QUEEN OF THE ARBOLITO



CHEVROLET • NUEVA CASAS GRANDES • QUINDIMAN

1972



ANDREW AT EIGHTEEN

LLANITO 1978



BERNALILLO MAIN CANAL (THE DITCH) 1976

JOSELIN LIGHTS A CANDLE IN THE PANtheon OF SANTA MARTA ON THE GRAVE OF SOMEONE HE NEVER KNEW, ON ANYONE'S GRAVE FOR THE PARENTS HE NEVER KNEW, AND FOR JUAN DARIUS AND JORITTO AND ALL THE ABANDONED CHILDREN OF THIS SMALL AND HISTORIC TOWN. BO LIVAR DIED HERE, AND I'M SURE SOME OF THE CHILDREN WILL ALSO. ORPHANS AND RUNAWAYS THEY CAN LIVE BETTER OFF OF TABLE SCRAPS AND GARBAGE THAN THEY CAN AT HOME, WHERE PAPA MAKES TWO BILLS A DAY IF HE'S LUCKY. HARRIS AND I MEET THE

SANTA MARTA, COLOMBIA, S.A.

DEC. 1972

WE ASKED THEM AGAIN, 20,000 NINE sleep in the STREETS OF SANTA MARTA.



CHILDREN IN DECEMBER OF 1972 AND PROMISE TO RETURN TO MAKE A FILM. A FILM FOR GW. ROINEFFILL, A FILM FOR AMERICA. SIXTEEN MONTHS LATER I RETURN AND GO TO THE CATHEDRAL, GO TO FIND JOSELIN. IN THE DARKNESS OF A HOT COLOMBIAN SUMMER NIGHT A CHILD APPEARS. HE IS SO MUCH LIKE JOSELIN, I THINK ITS HIS BROTHER. THEN AS JOSE SAYS "ITS THE GRINGO" I REALIZE IT IS JOSE. AND THEN JUAN STEPS FORWARD AND REACHES OUT HIS HAND. IN THE NEXT FOUR WEEKS WE ARE STARVED, SHOT AT, CHASED BY CIA TRAINED COLOMBIAN POLICE AND WITH THE CHILDREN SHOOT 20,000 FEET OF THE FILM THAT WILL BE "THE ABANDONED CHILDREN" THEN



JOSELIN IN SANTA MARTA DEC 72.

Dan... 1972

PRINCE OF THE FAMING COLOMBIA FOR CAMILO TORRES 1929-1966



Joselin at the Cathedral of Santa Marta

645:

An Ideal Format at Last?

BY DAN O'NEILL



Few photographers make square images, yet the square format camera has played, and is still playing, an important and durable role in photography. This seeming paradox is easily explained; cameras such as the Rolleiflex, Hasselblad, Bronica, Mamiya, Kowa, and others were *not* designed primarily to make square pictures, but to make good pictures under certain conditions.

The 2¼-square film format came into being as a practical feature of waist-level, overhead-viewing cameras; it allows the photographer to compose vertically or horizontally without tilting the camera. If he wants a rectangular picture, he can later crop, losing 25% of the image area when printing to a standard 8x10 format. Of course, some photographers *prefer* square images. In fact, in some areas of photography, particularly fashion and advertising, the ageless Hasselblad is still *de rigueur*, and rightly so.

Yet there are significant problems with the square-format roll-film cameras. One drawback is a loss of usable image area for enlarging. Another bug is the limited number of exposures per roll of film—12 exposures on 120 size and 24 on the newer 220 size. (Removable backs were introduced, in part, to compete with the rapid-fire power of a 35-mm 36-exposure roll. Of course, they offer the additional

advantage of allowing you to change film types in mid-roll.) Finally, even with modern designs, eye-level operation of roll-film cameras remains awkward, because camera shape and control placement are primarily designed for waist- and chest-level viewing.

Mamiya first attacked the square format with their model RB67. The so-called "ideal format" 6x7-cm negative enlarges full frame to fill standard paper sizes, but the larger image size cuts down even further on the exposures per roll of film. The vertical/horizontal problem is alleviated with a revolving back. The RB67 is a lovely camera, but it's even more of a studio machine than the 6x6 models—larger, bulkier, and heavier than any of them.

Pentax's 6x7 is an attempt to solve the mobility problem by using an oversize, eye-level 35-mm design. I find it too large and bulky to be comfortable, but still far more portable than the RB67. However, both take only 10 exposures on a roll of 120 film and 20 on a 220 roll. The Pentax is a one-piece without interchangeable backs, while the Mamiya has a two-lever operation for film advance and shutter cocking; the former is slow between rolls of film and the latter is slow between frames.

Kowa and Hasselblad have taken a different and more economical approach

The contenders (from left to right)—Kowa Super 66 with waist-level finder, Bronica ETR with AE finder, Mamiya M645 with PD finder, and Nikon F2 Photomic. Photograph at right was taken by Rosamund Purcell with a Mamiya M645 on Ilford FP4 film.

to the "ideal format" quest. Their 6x6 cameras offer interchangeable backs, so each has added a back using the 42x56-mm format. This smaller format (commonly called "645" for its nominal 60x45-mm dimensions) gives 16 and 32 exposures respectively, on 120 and 220 film. Unlike the Mamiya RB67, the Kowa and Hasselblad rectangular backs do not revolve. Of course, both cameras have available eye-level prisms, which I find necessary for vertical-format shooting.

The 6x7-cm image enlarges to 8x10 inches with a 3.6x magnification; 645 requires a 4.8x enlargement. Is the 1.2x worth the difference? Not for my purposes, especially because I use an Omega B22 enlarger, which will handle negatives up to 6x6 only. Going to the larger format would mean getting a new enlarger, which thrills me not.

While I like the idea of the 645 and its increased exposures-per-roll-of-film with no loss in quality (as compared with 6x6), the Hasselblad and Kowa versions are not ideal. Both remain essentially studio cameras, designed primarily for



waist-and-chest-level viewing.

The 645 format has far too much potential to be treated as an accessory of the square format. A camera system could be designed around this format that would be versatile, portable, and hand-holdable enough for photojournalism, street candids, and nature shooting, and also readily adaptable for most types of studio work. Recently, two manufacturers have taken up the challenge and designed completely new systems to try to take full advantage of this promising format.

The new contenders

The Bronica ETR and Mamiya M645 are 645-format SLR cameras that give 15 exposures on 120 (and 30 exposures on 220) roll film. Happily, both are intended for eye-level operation; the first hint of this is the body price of each—neither includes a waist-level finder in its basic cost, but lists it as an accessory.

Before I plunge into an evaluation of these new machines, some qualifications are in order for you to understand better my photographic background and prejudices. I started in photography with a Speed Graphic; my next step was to a twin-lens Rolleiflex, and then to a Mamiya C33. Somewhat later came my first 35-mm SLR, a Nikon F Photomic.

My current equipment includes a Kowa 6, a Nikon F, and a Nikon F2 Photomic. I bought the Kowa for studio work, yet rarely use it because my Nikons are more familiar and comfortable tools. Generally, my 35-mm negatives have enough detail and quality for acceptable 16x20 enlargements, even when high-speed film is used.

My partiality toward 35 comes from a few basic factors: it is compact and easy to handle; can be operated with uninterrupted viewing; is portable even with extra lenses and accessories; takes a lot of shots per roll of film, and takes them fast.

For testing, I acquired the Mamiya M645, equipped with a coupled PD meter prism, pistol grip, hand grip, 120 and 220 film inserts, 45-, 80-, and 150-mm lenses.

The Bronica system I used consisted of a camera body, two 120 backs, a Polaroid back, AE meter prism, speed grip, 40-, 50-, 75-, and 150-mm lenses.

In order to compare these upstarts with a 6x6 camera, I obtained the latest

Kowa, the Super 66, plus two backs (6x6 and 645 formats), 55-, 85-, and 150-mm lenses, hand grip, and the 45-degree non-coupled meter prism.

The final comparison system was my Nikon F2 Photomic, equipped with 24-, 50-, and 105-mm lenses.

As mentioned earlier, the 645 format is based on the most-often-used area of the 6x6 format, the section that enlarges directly to 8x10. Yet the ads and literature for both the Mamiya M645 and the Bronica ETR are designed to attract the 35-mm user. Mamiya makes direct comparison to 35-mm in ease of handling, weight, and portability, while pointing out that the M645 produces 2.7 times the image area. Bronica bills their ETR as a "super 35-mm" SLR with a large, ideal format for pros requiring big enlargements.

Both 645s are shaped like most 6x6 SLRs, longer than they are wide and rather boxy. Unlike 6x6s, though, both are designed to work at eye level and are easily turned for vertical compositions.

Even with their eye-level meter prisms on, the 645s are smaller and around a pound lighter than most 6x6 SLRs. More important, the 645s have a balance and feel that says "palm me and lift me to your eye." Part of the reason for this is that both models are narrower than the square-format cameras, and well-contoured for one-hand holding.

Here is a comparison of dimensions and weight of the 6x6-cm, 6x4.5-cm, and 35-mm format cameras:

Camera model	Dimensions (width x height x length)	Weight
Bronica EC/TL 6x6	5.4x4.2x6.6 in.	72.5 oz
Kowa Super 66	5x5.5x6.2 in.	67 oz
Mamiya M645	4x5x6.2 in.	58.7 oz
Bronica ETR	4.5x4.2x6.2 in.	55.5 oz
Nikon F2 Photomic	6x4x3.7 in.	42.5 oz

Note: The Bronica EC/TL has a built-in through-the-lens meter; the Kowa Super 66 has two add-on through-the-lens, but not coupled meters, neither of which is included in the above measurements. The height of the EC/TL and the Super 66 are measured with the waist-level finders closed.

Compared with square-format SLRs, the M645 and the ETR are very much hand-operable and portable. Comparing them to a good 35-mm camera is another story altogether. The contours and balance of the ETR and M645 are very good, but they do not, by



Bronica ETR with Speed Grip and AE finder. The tiny AE button (top right) has to be held in to display shutter speeds in the viewfinder. Thumb winder greatly speeds film advance.



Overhead view of Bronica ETR with finder removed and Speed Grip attached. The rather inelegant strips of tape at right serve to attach a leather holder for the dark slide.

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For this contrasty Brooklyn scene, the Bronica ETR with AE meter prism gave a good "compromise" exposure of $f/8$ at $1/60$ second, thus retaining detail in both highlight and shadow areas. A 50-mm wide-angle lens was used. This and all other photographs (except for page 85) were made by the author on Tri-X film. Grain is very fine on original 8x10 prints from 645 negatives.



Although a very-wide-angle 40-mm Bronica Zenzanon lens was used, little distortion is noticeable in this small "children's bridge." Exposure for overcast scene (as determined by AE light meter) was $f/16$ at $1/60$ second.



Predictably, against-the-light shot was rendered as a semi-silhouette by the Bronica AE light meter. Exposure was $f/16$ at $1/125$ with 150-mm Zenzanon lens. Black vertical scratches (disturbingly visible on the original print) were caused by an initially defective roller in the film back, which was corrected by the manufacturer.



Excellent tonal gradation and almost-invisible grain characterize this studio portrait of three sisters. Bronica ETR with Zenzanon 150-mm lens was used; Strobasol VX8000 and Reflectasol Soff Box provided diffuse illumination.

With fully informative viewfinders, both cameras would move a long way toward total eye-level operation.



Front view of Mamiya M645 with waist-level finder, standard 80-mm f/2.8 lens.



Side view of M645 with non-metering eye-level prism viewfinder, normal lens.



New model Mamiya M645 1000S, shown here with low-cost Prism Finder S, improved film advance crank, 80-mm f/1.9 "speed" lens.

themselves, make for practical eye-level operation. One very important factor in an eye-level system is the ability to handle all controls by sense of touch *without removing the camera from the eye*. Many good 35-mm cameras are designed for just such operation.

Another equally important factor is the information available to the photographer in his normal viewing position. In this respect, the square-format cameras are well designed, because all controls and settings are visible from the normal "waist-level" viewing position. Eye-level systems must transfer such information into the viewfinder prism, if they are to offer equal convenience.

For example, the viewfinder of my Nikon F2 Photomic shows the shutter speed and f-stop selected, plus the meter reading. The aperture ring is large and knurled for easy grasp with the camera in the palm of the hand—my fingers can shift easily between the focusing collar and the aperture ring. My left hand supports the camera; its



Overhead portrait of postman Calvin King, taken from apartment window, required eye-level camera operation. Mamiya M645 with PD finder, Deluxe L grip, and 150-mm lens did the job. Viewfinder light meter easily handled the flatly lit scene with an exposure of f/5.6 at 1/60 second. Limited depth of field focuses attention on face.

fingers control the focus and aperture rings without having to move the hand.

My right hand controls all else. The thumb pops out the wind lever 20 degrees to turn the meter on and also operates this same lever through a 120-degree arc to advance the film and cock the shutter. The index finger operates the shutter release. The middle finger controls the depth-of-field button. The other two fingers help support the camera. In addition, the shutter speed dial lies between the advance lever and the shutter release button, and is easily operated by the thumb and index finger without removing my eye from the viewfinder.

As you can see, all the controls are arranged to fall naturally under the hands and fingers. This facilitates operation by touch, in both vertical and horizontal camera positions.

The only major problem that I encounter with the Nikon is caused by my being left eyed, which brings the wind lever and my thumb into my right eye. Tilting the camera slightly toward

my left solves this problem, even though it probably looks strange to someone watching me in action.

Among the roll-film cameras that I have tried, the Bronica ETR comes closest to being as easily operable as my Nikon, provided that Bronica's Speed Grip is used. This hand grip attaches to the *right*-hand side of the body; the crank handle is removed and a "U"-bracket on the grip handle slips over the retaining pin, attaching the winding mechanism of the camera to a thumb-operated lever on the Speed Grip. In addition, there is a shutter-release button on the front of the grip that is operated by the index finger.

The Speed Grip is straight up and down, oval shaped, and contoured to fit comfortably in the hand. Gripping it keeps my arm close to my body, helping to steady the camera. It also works very well in the vertical position, with the camera hanging down from the handle and supported with the left hand—the same position in which a 35 is operated.

The film advance/shutter cocking

lever on the Bronica Speed Grip operates smoothly in either position, but has one drawback—you must advance it twice through 120 degrees before being ready to shoot again. While it is not as fast in operation as a 35-mm camera, it is still quicker and easier to use than a crank for eye-level operation. It took a while, but I did get used to the double throw and now feel comfortable with it.

The most important advantage of the Speed Grip, though, is that it allows the right hand to advance the film and release the shutter without moving the hand from its position on the grip. When using a crank, the hand must stop whatever else it is doing, and the photographer's full attention given to the operation of winding it in a full circle. The Speed Grip leaves the left hand free for other operations: focusing, changing aperture and shutter speed, checking depth of field, and supporting the camera body.

The Mamiya M645 grip attaches to the *left* side of the camera, which is the norm for waist-level-style cameras. This



Even the best of models don't always follow directions; this young lady was asked to smile. Fast-reacting photographer and camera (Mamiya M645) captured the moment. Exposure through 150-mm lens was f/8 at 1/125 second.



Studio "glamour" portrait of model Mary Collins was taken with M645, Mamiya/Sekor 150-mm lens. Original print is exceptionally sharp, with subtle skin tones and virtually invisible grain structure.



Kowa Super 66 with accessory 645-format back, 45-degree prism finder, and 150-mm lens captured this scene of Fulton Ferry boathouse and Manhattan skyline. Exposure was set according to prism light meter, at 1/30 second and f/11. Large, out-of-focus, middle-gray areas tend to emphasize grain, which is visible but not obtrusive in original 8x10 print.



Magazine reproduction is not ideal for communicating subtle differences in prints. The original 35-mm print (8x10 size), good as it is, does not quite match the sharpness and gradation of a well-made 645 image. Grain is also more apparent in 35-mm photographs, although not an important factor in a "busy" scene such as this; Nikon F2, with 105-mm lens, f/4 at 1/60.

645—IDEAL FORMAT *continued*

arrangement leaves the crank on the right side completely free for winding. The handle of the Deluxe L Grip is tilted about 30 degrees (top of the handle inclined toward the rear of the body) for, I suppose, more comfortable eye-level use. I find that this tilt keeps my arm away from my body and requires more tensile strength in arm and hand to keep the camera steady. Tensile strength creates vibrations, which in turn require that the camera body be supported firmly with the right hand. In addition, vertical holding of the camera is awkward with the hand so tilted.

The Deluxe L Grip has a shutter release button operated by the index finger. The fingers of the left hand can also reach and operate the shutter speed dial on the left side of the M645 without taking the hand off the grip. This dial is easy to move; in fact, I inadvertently changed shutter speeds on two occasions, once blowing 20 exposures on a 220 roll of film. (This problem has been corrected on the new Mamiya M645 1000S, which will be discussed later.)

If you choose to use the Mamiya Pistol Grip, which has a shutter release button for the index finger, your right hand has to operate the shutter speed dial on the left side of the body as well as set aperture, focus, and crank the crank. However, the Pistol Grip does give better one-hand support than the Deluxe

L Grip.

When the Mamiya PD Meter Prism is attached, the right hand must operate the shutter speed dial, on the right side of the finder as well as the meter-activating button. The shutter speed dial on the left side of the camera body has a special setting that transfers control of the settings to the shutter speed dial on the PD prism when it is attached.

I think that the M645 is far more operable without a hand or pistol grip, especially with the PD prism. This way, the left hand cradles the body, focuses, changes apertures, and releases the shutter, while the right hand operates the crank, shutter speed dial, and meter button. Without either grip, the work is more evenly divided between the hands, and the camera operation is smoother and more comfortable.

The Bronica also operates well without a grip. But I think it is a far better eye-level system with the Speed Grip attached because this eliminates the cranking problem. There are other features, though, that impede the ETR's eye-level operation.

Problems start with the operation of the aperture ring, which is tiny and has only two raised ribbed areas for the fingers to grasp. This space problem is compounded by the depth-of-field lever located close behind the left raised area, and the automatic/time-exposure slide bar on the bottom of the lens barrel

between the aperture and focusing rings. I have accidentally bumped that slide bar to the "time" position more than once, thereby overriding the shutter speed dial, locking the shutter open, and ruining pictures. New Bronica lenses have a set screw to lock the slide bar in place.

Even so, the automatic/time bar will remain a problem, because to close the shutter at the end of a time exposure, you must either cock the shutter or slide the bar back to the automatic position. Neither operation is ideal; in either case it is advisable to cover the lens.

The aperture ring is also a problem with the ETR, as it is quite difficult to find by touch. But even if it were easier to find, you would have to look at it anyway, as no aperture setting appears in the prism, but only in an inconvenient form that I will describe a little later when I discuss the meter prisms of both 645s.

The M645's aperture ring is a bit larger and slightly easier to grasp without looking than the ETR's, but it's not nearly as convenient as a good 35's.

The PD prism finder of the M645 is a full-aperture, coupled system that uses seven LEDs for metering; three red for overexposure, three red for underexposure, and one green LED for correct exposure. No shutter speeds or f-stop settings appear in the prism, which means you must often look to see where the settings are after you have

metered. Metering is center weighted, and uses the new fast-reading silicon blue cell.

A push button on the right side turns on the meter, but it shuts itself off after 15 seconds. This is a big pain in actual operation, because it often shuts off while you are still in the process of metering different areas of a scene or adjusting settings.

The Mamiya PD meter itself is accurate and quite sensitive. It is rated at EV 0-18 for ASA 100 films, which translates into readings from f/2.8 at 8 seconds to f/22 at 1/500 second.

The Bronica AE prism is four stops less sensitive at the low end and one stop less sensitive at the high end—EV 4-17 at ASA 100. The two silicon blue cells are listed as taking an average reading, but 90% of the reading comes from the central part of the scene, making it really a center-weighted system.

The AE prism finder has one major advantage over the Mamiya PD prism: it can be used as a manual meter or as a fully automatic exposure-control system. When the AE is turned to auto, the system bypasses the shutter speed dial and sets the shutter speed at the moment of exposure. The photographer preselects the f-stop and the meter does the rest.

There are three positions for the AE's meter switch—auto, off (in which the shutter will fire only at 1/500 second), and manual (for operation as a coupled through-the-lens meter).

You can find out what shutter speed is set on auto, or what shutter speed you should use on manual, by depressing and holding a tiny bar on the front of the AE finder, which lights an LED behind a row of shutter speeds at the bottom of the viewfinder. There are also two red arrows that indicate under- and overexposure, indicating that you must change the f-stop.

The automatic mode of the AE prism has a marvelous exposure-compensation control. Its normal setting of "1" is designed for average, 18% gray readings. When you are shooting a spotlight scene where two-thirds or more of the scene is in darkness, set the compensation control to "1/2" and fire away, secure in the knowledge that the spotlight area will be exposed properly. When shooting against the light, portraits in front of a window or snow scenes, set the control to "2x," doubling the exposure for correct rendition.

The AE finder does give more information than the PD, but makes it SUMMER 1977

hard to get. On manual, the AE only shows where the shutter speed should be set, with no indication of where it actually is. A set of arrows above the shutter speeds shown in the viewfinder could take care of that problem.

Both the AE and the PD need a way to turn their meters on and leave them on with full information display even if this means using an extra battery just to power the meters. Both now draw on the batteries that power their electronically controlled shutters. With fully informative viewfinders, both cameras would move a long way toward total eye-level operation.

I think that both 645s have been designed around scaled-down concepts of 6x6, waist-level-operated roll-film cameras. Physical shape is not the problem, as both 645s are contoured to work well in the palm of the hand at eye-level. (There is even a new Rolleiflex 35-mm camera in the works that is designed around the same boxy shape as the 645s.) The problem for me is that the controls follow the overhead-visible operation designs of the square-format cameras, instead of using the larger and more naturally located concepts of operation-by-touch used in the 35-mm field.

You can see the striking similarity in control design between the Bronica EC/

TL and both the M645 and the ETR. The EC/TL has a through-the-lens metering system with a display similar to the ETR. The LED display is activated by depressing the depth-of-field preview button. The difference is that the EC/TL user has his head bent over, looking down into the viewfinder. From this position, all controls and their settings can be seen without shifting the head. The controls are easy to grasp and operate while looking at them. The controls of both the ETR and the M645 are designed to operate in exactly the same way, by waist-level operation.

Yet the rectangular, 645 format seems to call for hand-held eye-level operation. Both cameras must be operated at eye level, with their prisms, if vertical composition is to be accomplished by anyone but Plastic Man.

Bronica has gone partway toward the 35-mm concept with the Speed Grip controls, but not quite far enough. The aperture ring needs to be wider, raised, and knurled through its entire circumference. The depth-of-field lever needs to be moved slightly away from the aperture ring, and the time exposure function should be interconnected with the shutter-release mechanism. A click on/off metering button worked by the thumb should be placed on the right-

continued on page 118



Life-size (1:1) contact prints. Top row: 42x56-mm images from 645 format. Bottom row: full-frame 35-mm images, 24x36-mm each.

FOOTWORK



Step-by-step directions for
making a footswitch
for a darkroom timer

By BILL SAUNDERS

In my years as a photographer, constantly refining my darkroom techniques, I have come to rely on the footswitch as one of the many necessary tools in making a good print. The footswitch as a darkroom convenience is not a new and original idea, and many photographers do not feel it to be important. They are wrong. Obviously the footswitch can save time and effort and keep you from handling darkroom equipment that could rust and corrode; in addition, by using one to control time during print and film processing, you can actually get better negatives and better prints, thus improving your overall darkroom ability.

Besides controlling time during print and film processing, footswitch duties in my darkroom include: 1. controlling the enlarger and safelight during print exposure times, 2. controlling the safelight overlooking sink during paper processing, 3. operating print-inspection and overall room lights, 4. operating light tables and work areas. For me the use of the footswitch has become so much a

secondary reaction that I take it for granted. I once found myself patting the floor with my right foot while making print exposures in an unfamiliar darkroom not equipped with switches. When I get an order for 100 prints or more and find myself at one of those late-night printing sessions trying to make a deadline, I find the footswitch indispensable. Near the end of those sessions, repeating the smallest chore becomes a hassle and no matter how close or convenient the timer was placed, my arms became weary from reaching for the timer reset arm. Now a single moderate pressure on the pedal of the footswitch is all that's needed, saving my arms for washing and drying yet to come. But the biggest consideration is the freedom I have when my foot is doing the monotonous work normally done by my hands.

You need not pay an exorbitant price to improve your darkroom skills. With the help of some basic electrical knowledge and tools you probably already have around the house, your own footswitch can be made for as little as \$1. With the

help of the accompanying photographic diagram of the electrical connections, I explain how to build a simple footswitch.

You probably know that you can purchase one as an optional accessory with most of the more expensive enlarger timers, but what you may not have considered is that your homemade switch can be used in conjunction with a number of other darkroom procedures, including developing film and paper with more accuracy. I will explain how to hook up the footswitch and darkroom timers, and describe the basic benefits of this system.

Nearly all timers have their own repeat features built in, which means it isn't necessary to reset the time intervals manually after each use. But the range of the timed intervals and the fineness of adjustments may differ from one timer to another. The common footswitch will repeat a timed interval, but will not predetermine or change time. Most footswitches have only a single on/off function and are usable only in the "time" mode. Separate "focus" and

"print" footswitches leave only the length of exposure to be set on the timer. The footswitch connected to my enlarger timer is very sophisticated in that it can function two different ways within the "print" (time) mode of operation—first, by pressing down and releasing it quickly, thus activating the length of print exposure and making it easier to achieve a series of identical print exposures without setting each timed interval by hand, and, second, by holding it down continuously for any desired amount of time in order to burn and dodge. At this point, my hands and feet will be working in unison. When I feel that a certain portion of a print has received enough burning and/or dodging, my foot is released from the footswitch. This action will simultaneously and automatically turn the enlarger lamp off and safelight on, causing the timer to return to the original designated period of time, without changing the initial print exposure time. Therefore, it is possible, by not having to make these adjustments manually, to give a correct print exposure time on a given sheet of paper from the same negative as many times as is desired without having to guess the length of past exposures, even when using, for example, a short exposure time followed by a longer burning and dodging time for the same print. I have not yet found a commercially available enlarger timer with a footswitch that works in this manner, although there may be some that I am not familiar with.

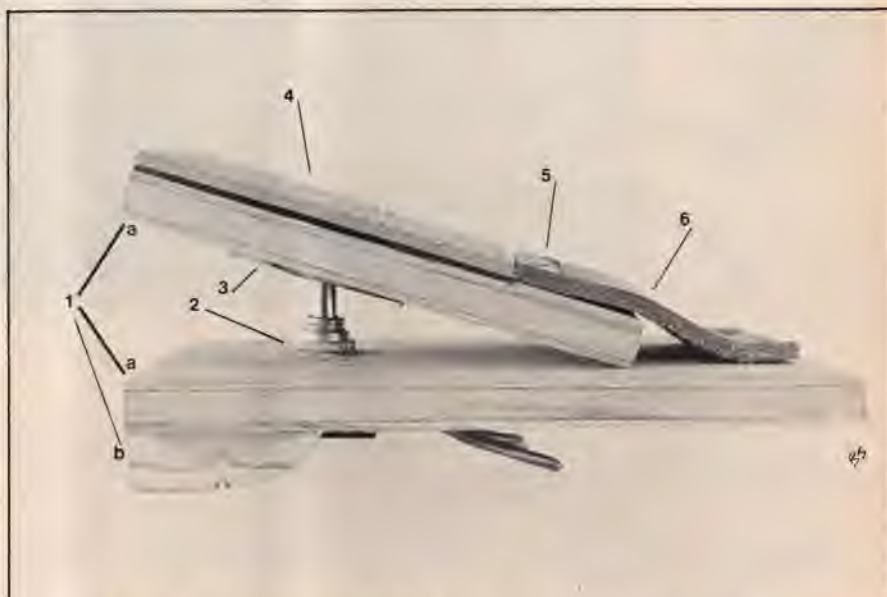
I find this particular system to be an enormous help to me in the darkroom. Let me illustrate. When following my usual routine in developing film, according to temperature, I first set the clock to the exact minutes and seconds of the full development time called for. In total darkness a full tank of soup sits waiting, reels are loaded, and the instant those reels hit the soup I simultaneously place the lid on the tank and start the clock counting down the time with the footswitch. This is done all in the same motion, losing no time in the start of agitation or in pausing to reach for the timer start control. Depending upon the length of footswitch cord, I could even start the timer from across the room while holding phone in one hand, pad and pen in the other. When one adds up the time pouring soup in and out of cans or fumbling around for the timer control, the time lost without a footswitch could very well add up to 10 seconds or more, making it virtually impossible to keep times consistent. In print development, I

make only a slight variation when using this system. The timer is set for the full 60 minutes shown on its face. The moment an exposed piece of paper hits the developer tray, the clock is started via footswitch. Hands are left free and unrestricted to make sure the paper is totally immersed in the developer. The specific time it takes to process the paper properly makes little difference. Let's say a particular print takes 2 minutes to produce a fully developed image. The clock is started, 2 minutes later it is stopped by activating the footswitch. The paper at this point is pulled from the tray and taken on through the next steps. The next sheet of exposed paper is then processed for 2 of the 58 minutes remaining on the timer. This method is a noteworthy convenience when it comes to batch printing, and certainly something that we all can appreciate when it comes to making color prints.

In addition to the above procedure, I have five footswitches working in

conjunction with different appliances and lights throughout my darkroom. Made of wood, they are light, sturdy, and very mobile. Some manufacturers of footswitches purposely make their models bulky and heavy with metal outer coverings to ensure that they stay stationary during operation. If I want a more stable footswitch, I just add some lead fishing weights. I also cover each pedal with a strip of different-colored illuminated tape, making them more visible in the dark and easier to distinguish, each having its own color denoting a specific function. I personally prefer my lightweight homemade models when fumbling around in the dark because I'm more inclined to kick them aside rather than trip over a heavier stationary object.

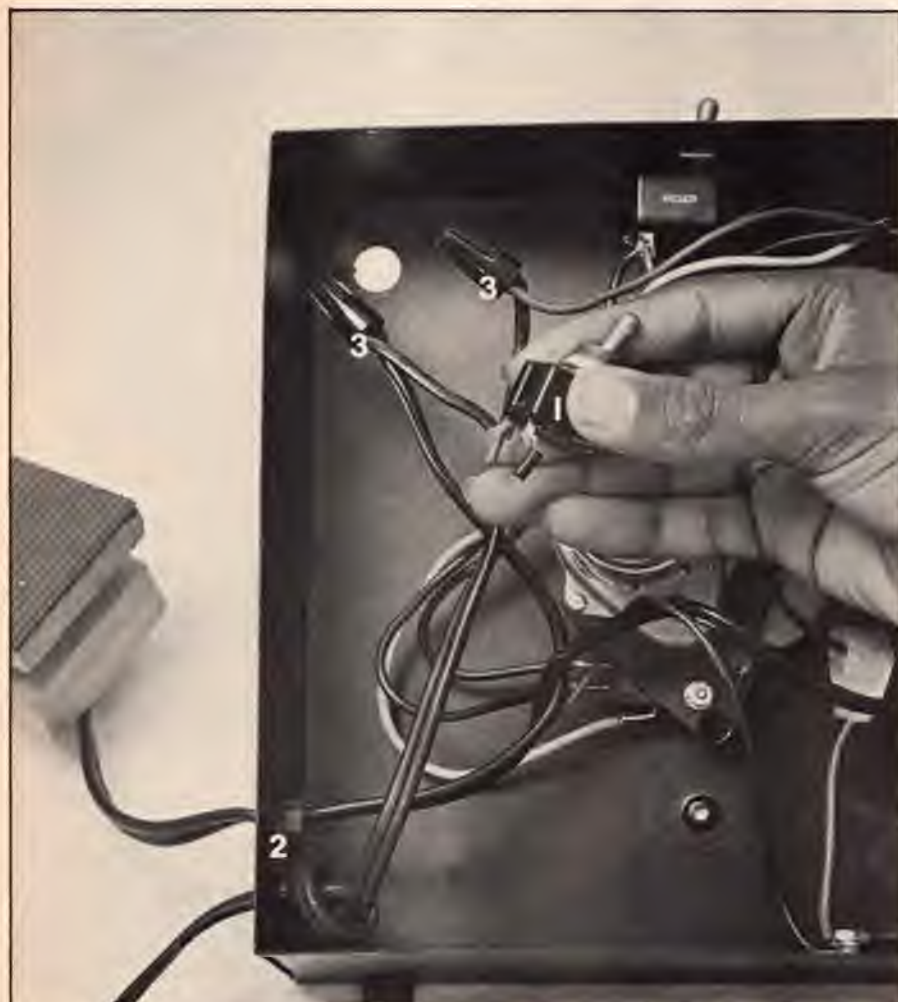
Some footswitches are not restricted to foot operation alone. I sometimes hand-hold the pedal that is connected to the safelight overlooking the developing tray. When a sheet of paper is first immersed in the developer, off goes the



THE PROCEDURE AND THE MATERIALS

Following is a suggested procedure and list of materials needed to make a footswitch. Overall size, type, and quality of materials are a matter of personal choice.

1. a. Two pieces of $\frac{3}{8}$ -inch-thick plywood—one for pedal top, one for pedal base.
b. One piece of $\frac{1}{2}$ -inch-thick contoured wood trim to be glued to pedal base for bottom support.
2. Pushbutton (or canopy) switch to be placed in a hole to be made in $\frac{1}{2}$ -inch diameter (switch to be epoxied in place).
3. Small pad (leather or rubber) to be glued under pedal top to cushion button.
4. Rubber tread to be glued onto pedal-top surface.
5. Four screws to hold hinge in place.
6. Hinge (leather or rubber) to connect pedal top to pedal base.



FOOTSWITCH-TO-TIMER WIRING

Back of timer, with cover removed. **1**, on/off toggle switch is removed from opening shown in upper-left corner by splicing wires. An entrance hole **2** is made at left bottom of timer just above power cord. Footswitch wires are inserted through hole and connected to spliced wires **3**, which were formerly connected to toggle switch **1**. Procedure is explained in detail in text.

safelight by pressing the footswitch. It will stay off during the first few stages of development. Near the end of development I flash the safelight on just long enough to make a quick evaluation of print progress. I can also move the safelight closer to the tray than recommended since observation is only made momentarily at the critical point; *this assures me that prints will be fog free and allows me to see a clear image developing during the closing stages.*

The cost of any accessory footswitch (footswitch used in combination with enlarger timer and safelight) on the

market may be anywhere from \$15 to \$25 and will still have to be modified for the above described system. An ordinary run-of-the-mill footswitch can cost as little as \$5 and up, but you can spend as much searching to find the best and cheapest buy. In either case, I'm talking about the use of as many as four switches or more. This could add up to quite a sum if bought in a store. As you can imagine, the savings are considerable when you make your own footswitches. When figuring cost, remember that some tools bought for a specific project will sit around for ages

while still others can be used repeatedly for many household needs, thus paying for themselves. To save time and aggravation, I made a list of necessary materials and called stores in advance to be sure that the items were in stock.

Within my tool cabinet I have a special box that holds leftover odds and ends that I've used in previous projects—a box full of so-called useful items, most of which should have been thrown away years ago. I find it hard to discard anything if there is a chance I can turn it into something of worth at a later date. Before I started buying materials to build the pedals, I searched my tool cabinet and the house for useful materials, checking my list off as I came upon something workable. After gathering, among other things, a 6-foot length of three-wire grounded a.c. cord (the kind used in most homes for light-duty appliances), wire cutters, and electrical tape left over from repairs made on TV antenna wiring, pieces of 1/8-inch-thick plywood left over from a dollhouse built for my daughter's Christmas present, and the most useful item of all—a soldering iron borrowed from my wife's P-tex kit used for melting plastic on skis, I found I only needed a few more items to complete the project.

Before describing how to hook up the footswitch to the enlarger timer, first some basic points about household electricity and switches for those of you who are unfamiliar with this type of wiring. In most houses, there is a two-wire 120-volt system that serves most electrical outlets. One wire is covered with black insulation; this is the "hot" wire, through which the current passes. The other wire, covered with white insulation, is called the "ground wire." (Never acquire the misconception that the white wire is any less dangerous than the black simply because it is not called a "hot" wire. From a safety standpoint it is just as "hot" when the current is turned on.) At some point in the system this wire is connected to a water pipe or metal rod driven into the earth to provide a good ground. The ground wire should always have a continuous run back to the grounding point for safety. The outlet boxes for electrical outlets, fixtures, and switches are also grounded either by the metal covering on the wiring or, in the case of plastic house wiring, by a third wire in the cable. Rule number one in handling electrical equipment is: never handle it

at all if there is current flowing through it. When starting a project, pull the main switch or unscrew the branch circuit fuse or flick the circuit breaker to "off." Never handle electrical equipment with wet hands or when standing on a wet or damp floor.

Electrical switches come in all shapes, sizes, and descriptions. The light switch that we flick up or down upon leaving or entering a room is called a two-position type. You're probably more familiar with the "toggle," a common two-position switch found in the house and apartment. The toggle uses an armature (steel spring located on the inside of the switch enclosure) that touches a terminal when the switch is thrown to its "on" position, establishing contact in the circuit. When the lever is pushed down to its "off" position, it breaks contact, thus stopping the flow of electricity. For the pedals, I find the so-called press or pushbutton switches work best. Working on the same principle as the toggle, most are built with a spring tension inside. This type incorporates a little device that holds the button to the "on" position when you press in, continuing the flow of electricity without the need of any continuous physical pressure on the button until one gives slightly more pressure to release the "holding latch," thus letting the button spring out to the "off" position. In actuality, this works on the same theory as a wall-mounted light switch, the difference being that you push in and out instead of up and down. These switches can be bought at most electrical supply stores and at some hardware stores.

Almost all darkroom electrical devices have an on/off mechanism built in. This is commonly no more than a toggle switch placed in a readily accessible area. For manual timer operations I use a Gralab Model 300 timer. It sits over my sink, strictly as an aid in gauging the processing times of films and prints. The same principles can be applied to just about any timer not equipped with footswitch provisions. By following some simple steps, the functions of the on/off mechanism can easily be taken over by a pedal. Make sure the timer is unplugged, then remove the back cover (see photograph of timer interior). First, remove the six screws that line the side of the body holding a metal jacket in place. Inside, you will find at the top left side (facing you) the back of the on/off toggle switch with two wires extending

from it—one black, one red. The black one is part of a three-wire a.c. power cord. It runs directly to the switch bringing current to that switch. The red will send current flowing to other functions within the body when the toggle switch is in the "on" position. This flow of electricity can be manipulated by the footswitch mechanism. Next, splice the two wires by cutting them from that switch, then scrape bare about an inch of insulation from the ends of these two wires (black wire is "hot," red wire is "neutral.") The



Close-up of pushbutton switch (also known as canopy switch) that turns darkroom timer on and off when pedal is pressed.

bared sections can then be twisted like a rope. Next, remove the inoperable toggle switch from the timer by unscrewing a nut located at the front of the clock. The two a.c. wires leading from the already made footswitch, (black "hot" and white "ground") must also be spliced in this manner. Make a hole at the side of the timer about $\frac{3}{4}$ -inch in diameter through which the ends of the footswitch wires are passed. This hole should be made just below the exit hole holding the three-wire a.c. power cord in place. Before placing the ends of the pedal cord through the newly made exit hole at the side of the timer, a fiber bushing should be placed on and around the cord where it meets the opening. This will protect the cord from the sharp edges of the hole. If you tie the cord into an "underwriter's" knot just inside the exit, you will secure connections and help prevent them from being pulled

apart. The wire ends are then joined together, black to black and white to red using solderless connectors or covered over thoroughly with electrical tape. Check to see if all connections are made correctly before replacing the metal cover. Once this is done, plug the three-wire a.c. power cord into an electrical outlet and you're ready to go.

Line-current fluctuations may vary the intensity of light while you are activating your photo-timer during print exposure or while repeatedly turning it on and off during the burning and dodging process. This could cause some printing problems. When that light passes from the condenser of the enlarger and then on through the negative, its illumination must be kept as dependable and even as possible or the intensity of the image projected onto the light-sensitive paper will increase or decrease. The light variations may be of enough magnitude to change the contrast of variable-contrast enlarging paper, to an extent that may or may not be very discernible in the final prints. In any case, you might find it rather difficult to produce a matched set of prints from the same negative. Don't despair and throw away your newly made footswitches. If you do have serious line-current fluctuations, try the addition of a voltage regulator, a mechanism for controlling and governing the flow of electricity.

Understanding the range of tones and values within negatives and prints, along with proper film and paper processing habits are prerequisites for a successful final product. If you're making good exposures along with full print development according to the manufacturer's suggested times for a particular paper, you're headed in the right direction. However, there are different techniques and variables involved in the making of high-quality prints. No two photographers' working habits are completely the same, even when using the same methods or formulas. Everyone brings his or her personal characteristics into the work. Although the footswitch systems I have devised are a great help to me in the darkroom, it's important to remember that mechanical measurement should be used only as an aid toward the final product. Clocks, timers, and most mechanical devices are no real substitute for personal judgment.

time. However, it is very doubtful, when you compare the cost of an analyzer to the cost of paper and chemistry, that the use of an electronic analyzer will save you money over any reasonable span of time.

To understand why the benefits I've mentioned are so circumscribed, it will be necessary to take a detailed look at the machine's inherent limitations. To get any utility out of an electronic color analyzer, you will have to be even more expert, in all aspects of color printing, than you would if you simply stuck to the various alternative approaches to color print analysis offered in the earlier installments of this series, and never bothered to try to analyze your negative prior to making a print. When using an analyzer, you will not only have to understand all of the processes and procedures involved in color print making, but you will also have to understand all of the many things that can affect the operation of an analyzer.

Before you can as much as turn on the switch of any analyzer, you will have to be capable of producing an absolutely flawless color print of a standard negative, all by yourself, or perhaps with the rather limited aid available from a subtractive calculator. Once you have made your perfect print, you may program your analyzer with the data you painstakingly arrived at without its help. You must also be very careful to record everything pertinent to the many other variables involved in the exposure and processing of your calibration print, because *the program you load will be limited in its application to prints that are made with materials and processes identical to those used to make the calibration print.*

For example, if you make your calibration print on Kodak 37 RC paper in Beseler chemistry, the program obtained won't be of any use whatever if you switch to Chromega paper or decide to use Unicolor chemistry. As a matter of fact, the program won't be of any use even if you stick to the original materials, but run out of paper and have to purchase a new supply that is from another emulsion batch.

Your program will also be limited to the use of the same enlarger and the same set (but not the same values) of filters. The program will apply only to the type of processor you used, and the particular way you used it (time, temperature, agitation, procedures, etc.). It will only cover the enlarger lamp you



Omega Simetron II analyzer, unusual in that it is placed below lens for color programming . . .



. . . and analysis, and on the easel for exposure programming and analysis.



Simetron II's turret-type probe mounts its own swing-away diffuser plates.

used—if it burns out and needs replacement, the analyzer will have to be reprogrammed all over again.

But, perhaps most important of all, the program you load into your analyzer will apply only to the type of film your standard negative was made on. If your standard negative is on CPS and you want to analyze a Vericolor II negative, the CPS program won't work. (This is due to the rather gross differences in the printing masks of the various brands and types of color negative material. Masks are composed of the orangy residual couplers that remain in the negative after processing; they are there to achieve a contrast match between the dye characteristics of the negative and those of the printing paper.)

As if all this weren't enough, the analyzer's performance subsequent to being programmed is subject to all kind of vagaries. For example, your darkroom's temperature and its relative humidity may affect your analysis of a color negative. So may electrical power fluctuations, probe-cable configuration, ambient light in the darkroom, and, for all I know, evil spirits and sun spots—at least it has sometimes seemed that way to me.

Aside from all of the above-mentioned problems, you also must consider the applicability of the program to the particular negative you want to analyze. You may recall the earlier mention of subject failure when using the integrated-reading-type instrument as one case in point, but there are several others that can also haunt you when using a spot-reading type of instrument. For instance: let's assume you have loaded a "middle-white-skin-tone" spot program and you have a negative of another caucasian female to print. Even in the very unlikely circumstance that the model for your standard negative had a complexion remotely like that of the subject of the negative to be analyzed, it would be up to you to be smart enough to recognize an identical middle flesh tone in the projection of the white subject's image on the easel, and then to be able to position the probe in that exact spot. Even if you are that smart and able, it is doubtful that the projected image of the white subject's head under consideration will be at exactly the same distance from the enlarging lens's optical axis as the projected image of the subject's head on your standard negative was. Since the distance at which a probe is placed from the optical axis will very definitely affect the readings obtained during negative

**It probably won't
take too long to work
out a scheme to use
your analyzer for
anything from a
reflection
densitometer to the
front end of a color-
code-operated
electric garage-
door opener.**

analysis, you will either have to reposition the negative in the carrier, or shift the lens board, to bring the spot under analysis to the same position your programmed spot had, or be smart enough to guesstimate the effect of the offset. (Don't bother calculating; your guess will probably be as accurate.)

Then too, there is always the problem of surface reflectance and texture to consider when doing a spot analysis. You may be clever and patient enough to load your analyzer with 10 different programs for everything from brick-red to distant-mountains'-purple-majesty, but if the bricks or mountains in the negative under analysis had a different surface texture or reflectance or, heaven forbid, color, than your programmed brick or mountains had, you can forget the applicability of the program; it simply won't work properly.

You are going to have to be smart enough to realize all of this every time you turn on the analyzer, or you might just as well not bother. If you *are* that smart, and if you are willing to standardize completely all of your operations and materials, and to prepare separate programs to cover any and all changes in material, subject matter, ambient conditions (and evil spirits?), then you will be able to do some very fast work indeed. Properly programmed and used, modern analyzers of good quality are easily capable of providing you with enough information to set your enlarger to make a commercially acceptable color print of a decently exposed negative in a matter of minutes. It is highly unlikely, though, that a really critical worker will settle for the print so obtained. At least I've not yet run across an analyzer that was able to put me right on the money. But with the analyzer

SUMMER 1977

operating to get you very close on your first print, it may be necessary to make only one or two more prints before a critically satisfactory image is obtained. All of which means that a properly used analyzer may save you as much as a quarter of an hour and the cost of a sheet of paper and the chemistry to process it in, *per print*. That is not an inconsiderable saving, but remember it is predicated on the *proper* use of the machine.

One final note on the limitations of color analyzers. To the best of my knowledge, you cannot use any of the machines presently on the market to perform color analysis of slides for use in reversal printing. You can, however, program and use any electronic color analyzer to determine the overall illumination level needed to obtain a perfect reversal print. Once you have made your calibration reversal print and programmed its data into the analyzer, that determination is all that is really needed to produce prints from other slides *on the same kind of slide film*, subject, of course, to all of the above-described vagaries and limitations applicable to using such machines to analyze color negatives.

General procedures for use

Specific operating techniques differ for each manufacturer's electronic color analyzers, and even among models from the same manufacturer. In general, though, all of these machines are programmed in much the same way as my hypothetical little analyzer was in this installment's *Principles of operation* section. There are, however, several general techniques of use that are applicable to any machine, regardless of manufacturer or design, and they are the ones I will concern myself with here.

Overall gray card program

The most universally useful and applicable type of program I know of involves the use of an 18%-gray card. It can be loaded into an integrated-reading or a spot-reading type of machine with equal facility, and is probably the most accurate and foolproof program available for use with analyzers. To develop such a program, it will be necessary to expose very carefully a frame of the type of film you most often shoot, to render a frame-filling image of an evenly lit 18%-gray card. Since most 35-mm SLRs don't show you the entire frame you are shooting (see *What You See Is Not What You Get*, elsewhere in this issue), be careful to get in close

enough to more than fill the viewfinder window with the gray card's image. Use tubes or a bellows if necessary. Once the film is properly processed, a perfect print must be made by means explained earlier in this series. Be very careful to compare the prints you make to the card itself. Don't stop making prints until you get an excellent match with the actual gray card, making whatever allowances are necessary, of course, for differences in surface texture between the print and the card. This done, record all of the data pertinent to the way the calibration print was made and program your analyzer, be it integrated-reading or spot-reading, using the gray-card negative and the procedure called for by the analyzer's operating manual. Now, in order to gain anything from the tedious work you have already put in, you will have to include the same 18%-gray card in at least one frame of every roll that you shoot under controlled lighting, or in each frame that you shoot under variable lighting. If you follow this procedure you will always have a known standard to analyze. But I will grant you that trying to get a gray card into each and every frame can be difficult, if not ridiculous.

Standardizing procedures

It is essential to remember that the program you load for a calibration print made on paper from one emulsion batch most often won't work for prints to be made on paper from another emulsion batch. If you intend to use an electronic color analyzer, it will be a good idea to buy as much printing paper from a single emulsion batch as you can afford. Don't bother even considering the purchase of any quantity less than 100 sheets. Buy several hundred if you can. Be sure to freeze the unopened boxes, because if you don't, the color qualities of the paper will change with time, and you will be no better off than if each of your unopened but old and unrefrigerated boxes of paper had come from different emulsion batches. Once a box of paper has been opened, it's a good idea to put the sheets of paper in the box into a vapor-tight wrapper, if they are not already so packaged. When the remainder of the paper is to be stored between printing sessions, it will be useful to expel as much air as possible from the inner wrapper and to refrigerate or refreeze the paper until you need it. Most paper manufacturers seem to recommend against this refreezing technique, because of the damage that water vapor

continued on page 116

"Light is a humanizing place, it's not just a retail outlet. We are not a high-pressure sales gallery where we have floor walkers around trying to sell photographs. We don't even sell very much off the walls.... The idea is to show people new ideas, work that changes, the way the photographers work."

—Victor Schrager



feeling of faith. "I know at this point I am quite content with the way things are working out. I've been around for a long time. I know I have a reputation so it is good for both of us." Without that feeling, Newman claims, all the legal contracts in the world are meaningless as far as he is concerned.

The contracts, even though Schrager insists they are mostly the same, are negotiated individually with each photographer. Each agreement is intended to provide a convenient and stable reference, so that any situation that arises will already have been worked out in advance. This tends to eliminate possible misunderstandings. The contract is not meant to be restrictive or punitive and "I'm not going to use it to sue anybody," says Schrager.

Basically, the agreement outlines where a photographer will be represented. Usually Light asks for exclusivity internationally; however, there are exceptions. Lee Friedlander, for instance, recently joined the Light "stable" of photographers, but already had representation in other cities, so that had to be worked out amicably . . . and was.

A certain percentage is agreed upon. Usually Light keeps the standard 40% of sales, giving the photographer 60%. If Light sells work to another gallery, the photographer's percentage drops to 50%; Light usually keeps 20% and the other gallery gets 30%. But again there are exceptions. Discounting sometimes complicates the percentage breakdown. Lending services and architectural consultants often get 10-20% discounts, and there are dealer, gallery, collector, and institution discounts. All of the potential variables are dealt with beforehand in the agreement.

In addition, if Light arranges a lot of reproduction rights, it takes a

percentage of that. Bill Larson views this as an advantage in the sense that Light evidently has the resources to handle such occurrences very efficiently and it is nice for a magazine, trying to put together an article, to be able to come to Light rather than having to track down artists scattered all over the country. And for the artist, Larson says such "efficiency lends itself to publicity." But Light draws the line. Schrager says, "If we are lucky enough to be able to refer some work to the photographer in the way of an editorial job or an interview or a publishing contract, that's just good will. We have nothing to do with that business. We're not a photographer's rep."

Private sales are another complicated matter. Newman, for example, is permitted to sell from his studio if he wishes, but voluntarily has limited such sales to only close friends, he says. Bill Larson thinks it is more advantageous to sell everything through Light because the more sales he generates, the more Light's commitment to him will be reinforced. But certainly the area of private sales is a different matter from photographer to photographer. The contract, therefore, irons out what is expected. That way, Light and the photographers do not end up by competing with one another to sell to the same institution. Stephen Shore, for instance, just had a limited edition portfolio published by the Metropolitan Museum of Art (12 prints for \$1,250, issued in an edition of 50), which was worked out separately from Light as part of his recent Light agreement. Shore's justification? "I can get more money from doing a portfolio than I do from several years of sales at Light. We help each other. They need the work to show and I need a place to show it. Neither of us has any advantage in trying to screw the other. I want to show there and they

want to show me. But this (the portfolio) is separate. I'm not signing my life away to them. And they don't expect me to."

The idea of being represented by Light, according to Schrager, is that the photographer makes the pictures, drops them off, and does not have to worry about them. There is "one inventory to worry about, one place to collect the bills, one set of people to deal with, one set of people to like and dislike, complain to, whatever." For shows, Light frames the prints, mats them, pays for the announcements and insures the work. And, "a photographer can walk in and look at our books any time. We have no secrets from them. We're not fooling around with their money," says Schrager. So that there are no surprises, the payment procedure is also outlined clearly in the contract.

Usually a contract with a new photographer will be for a one-year period. With some photographers, however, Victor extols "it's a marriage made in heaven and sometimes with them I'll ask for a three- or four-year contract." But, Schrager reiterates, "I would never ever use a contract against a photographer. If a photographer has to leave, I'm not going to sue him."

Light *would* use the contract as protection against another gallery encroaching on a photographer and trying to lure him away. When asked if that had been a problem, Schrager evasively retorted, "Obviously within the past couple of years one or two photographers have left and in 90% of the cases it's been very open and positive and friendly because we've both understood it's been the best thing. The other 10% was murky. Sometimes it doesn't work out as well as it might."

The contract also outlines that the artist will be given a show every two years. But of course that has to be flexible since not every artist works at

the same rate, nor does Light expect them to. The exhibition schedule is worked out about a year in advance and the shows rotate between big and little, old and new, to make "a good gallery program."

The photographs are handled almost entirely on a consignment basis. Photographers are expected to provide Light with a constantly changing supply of work to insure good representation. "I sell their fine prints intended for sales and exhibition," says Schrager. "What I have here or what I can order." All the photographers are always on exhibit in the sense that no matter what show is on the walls, if a visitor is interested in seeing other work, the Light staffers are receptive to satisfying requests and to discussing other material.

To further accommodate the more regular collectors in the gallery, Schrager is toying with a few new ideas. He would like to have weekly intimate get-togethers where collectors and photographers could talk and get to know one another. (The idea might be extended to include evenings with critics, students, photographers, friends, etc.) Also, Schrager is thinking of designating a small room in the back to be a collector's room where selections could be stored and the collector could leisurely contemplate buying.

Light promotes a great many traveling exhibitions for its photographers and arranges about 80 each year. That is part of the reason why Light finds exclusive representation necessary. Every show is custom-designed to the needs and interests of the exhibitor, usually by Light staffer Larry Miller, who organizes and sends out the shows. When a new gallery approaches Light to order an exhibit, Light requires that the gallery present their insurance certificates and pictures of their gallery. "We are responsible to the

photographers and we're not going to send their work off into the blue," says Schrager.

Though Light, in turn, has exclusive representation with a number of independent galleries around the world (e.g., Photo Gallery in West Germany handles Light material in several European countries), Light is not particularly interested in franchising or having "little Lights." Schrager feels "it's nice that the Light people are handled by different people with different vocabularies in different communities."

As far as promotions, shows at Light are considered by many to be quite prestigious in themselves and for each, an announcement is mailed to a list of more than 2,000 people. The exposure is wide, judging from the number of reviews Light gets per year, which Schrager finds "staggering." The catalog Light published for the first time this year is another way of promoting its photographers; in addition, it provides helpful biographical and price information. And occasionally a Light staffer will go on a selling trip.

Light has also worked out a convenient service to the photographic community by amassing a file of its photographers' interests concerning lectures, workshops, teaching, etc. When such requests come flowing through Light, they can now be passed rapidly on to those photographers who might be interested.

Schrager looks at about 40 portfolios of new artists a month. A photographer will be asked to leave a portfolio for about a week. After Schrager has seen it, he initials it. If interested in talking to the photographer, he will get in touch. "It's very impersonal and that's too bad," he says. "But I don't have 40 half-hours a week to spend." He finds little pleasure in giving rejections and usually they are not rejections, but "not nows" or

"we're not the right place for you." When considering taking on a new photographer, Schrager will often discuss it with the other staffers to find out how they feel about the work, since he is not the only one who has to deal with it once it is accepted. Other members of the Light staff include Larry Miller, Susan Harder, and one of the owners, Fern Schad. Tennyson Schad does all the legal work. In addition, he and Schrager typically have weekly meetings and "work things out together." Says Schrager, "He has a sort of funny overview because he's not here. He comes in and sees things that sometimes we don't."

Schrager is somewhat saddened in a sense that the "incredible creative burst a new gallery has" has slowed down. The "false idealism" of every show having to be completely new has diminished slightly. He regards being entrusted to represent a Callahan or a Siskind or a Sommer as "a very big and very serious job" and therefore, he says, "I can't just constantly develop so much new stuff and show 18 new artists and neglect them."

In terms of the competition and the fluctuating marketplace, Victor Schrager says complacently, "I'm not worried about booms or not booms. We were doing what we were doing before there was a boom and we'll be doing what we're doing after it."

SIDNEY JANIS GALLERY (6 West)

For almost three decades, the Janis Gallery has held a distinguished position in the art community. Personified by 81-year-old Sidney Janis, the gallery has always been a major force in innovating and introducing art trends, e.g., pop art, folk art, cubist art, and so forth. Last year, for the first time in its history, the Janis Gallery offered its public *photography* with a show of women

photographers arranged by the San Francisco Museum. Not long after, Janis followed it with an exhibition of leading photographers' portraits of leading painters. The latter show "was a knockout from the point of attendance," Sidney Janis relates. "We were surprised at the time that we broke all attendance records in the history of our business."

What prompted this long-established gallery to turn to photography at this time? "Photography hasn't been a new interest to me," Sidney Janis offers. "In fact, I became interested at the time Julien Levy opened his photography gallery in 1931. He showed some unknown photographers: Cartier-Bresson, Walker Evans, Ansel Adams. And I met these photographers and saw their work at that time. I had no idea at that time of being in the art business, nor did Julien Levy think he would turn his interest later to a straight art gallery." Janis's late recognition of photography, he says, has not so much been a "reawakening," but "when I began the gallery 29 years ago, I had a list of exhibitions that would last about 30 years. So I didn't really have room to slip in photography until very recently. We're finding more opportunities of doing it now." Somewhat defensively, he explained, "... It happens to come at an opportune moment, but I don't think we have been opportunistic. We've had a long-standing interest. If we seemingly got on the bandwagon late, it's because we were preoccupied with scheduled exhibitions that went on for years. We only do eight shows a year."

At the moment, Janis Gallery has officially taken on representation of one photographer, Duane Michals, but admits to being in negotiations with leading photographers to offer them one-person shows. Janis's policy is not to approach photographers immediately with a contract, but rather invite them to do one-person shows. "That casual, or that non-pressing, approach works much more favorably than twisting the photographer's arm getting him to sign a contract before even showing any results," says Sidney Janis. "We do that with a lot of painters too. ... If it turns out favorably, then we can go on from there."

Janis has no commitment to any one style or category of photography. His intention is to try to be as "catholic" in

the approach to photography as to painting and sculpture. "I don't think our gallery will fit into a groove there any more than it does in painting," he says.

Duane Michals confesses that he likes being represented by an "art" gallery. "I hate all those definitions and yet it is prestigious. ... Janis shows other people that I like and I am flattered to be there. I feel part of a tradition." Michals is triumphant too, in the fact that he regards himself as "one of the few photographers who has crossed the line, who will have a wider audience than just the photography world."

Photographs do introduce other problems for an art gallery, however. Janis says, "It's a piddling income. It's a bookkeeping nuisance really. I don't think it will ever command the prices of painting merely because I think it's—I wouldn't say, a transient medium—but it's not permanent. I have some photographs at home that discolored 90%." He continued, "But I think it's going to have a very prominent place. The very fact that I find it's not a permanent medium doesn't mean other people really even think about it."

Yet photography's inclusion in the Janis gallery is not to be overemphasized. Janis is emphatic that his role is not a major one; photography will be done in connection with painting and sculpture. His main interest will still be younger painters, since that is what he considers his *metier*. "And photography we're very happy to intersperse when we can." Right now, the Janis Gallery is preparing for two or three photography shows: one, so far scheduled for the fall, is to be a Man Ray exhibition, which will include photography along with Man Ray's drawings and objects.

KORNBLEE GALLERY (20 West)

Michael Steinberg, of the Kornblee Gallery, cautiously discusses the gallery's interest in photography. "I can

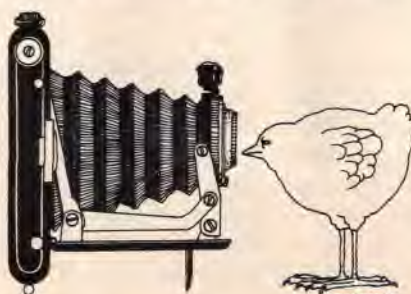
never say about us—never. We are open and alive. Part of the fun of the work for us is the process that goes on. There's a limit to how much you can do, and there are effective ways of using your energy and ineffective ways of using your energy and I think part of any gallery success is the degree to which it focuses."

Within the realm of paintings and drawings, Kornblee is known as an eclectic gallery in terms of style. The handsome, skylighted Kornblee Gallery has had one major photography show, the history of fashion photography, which was held last year; it came about primarily because of a friendship with the show's organizer. Steinberg explains: "That show was essentially a service and a historical kind of show in which we were really a replacement for an activity that would normally be a museum kind of activity. And there were some sales out of it and that was completely accidental. It was not our intention or our interest at that point."

The Gallery does represent Russell Drisch, a photographer who does hand-colored photo enlargements that, Steinberg says, fall "somewhere between photography and painting." Representing Drisch means arranging exhibits and making sales for him as the gallery would do for its other artists.

In principle, Steinberg says, the Kornblee staff people do keep their eyes open and regard the service of looking and being available to artists as part of their commitment to contemporary art. "When I say we are not actively looking, the position for us is that we already represent 35 people and we can't possibly do an adequate job for a number bigger than that at this point in our history," says Steinberg. "If we see something that excites us to the point that it's irresistible, then we might try to make some adjustment." Kornblee has been approached by photographers and continues to be in touch with very good photographers. For instance, Elizabeth Arden did a new series of ads with Deborah Turbeville and wanted to do a press party at Kornblee. The result was a one-night show.

Michael Steinberg is delighted to welcome and visit the other galleries settling into 57th Street, but observes that "If I have any objection to it—and I really am not familiar enough with it to even say this—I would think that there



seems to be a terrible lack in the photographic galleries of commitment to things other than brand names, other than sort of vintage and established prints. And to the degree that we are committed to contemporary art as a living and an ongoing thing, I feel uncomfortable with all the photographic galleries which seem to be involved only with the masters."

ROSA ESMAN GALLERY (29 West)

The Rosa Esman Gallery is small, but full of vitality and freshness much like its director Rosa Esman. The gallery is devoted to abstract art, but not exclusively, and is certainly receptive to what is happening now. Photography is happening now and has become part of the gallery's makeup.

Last year, Esman organized a "Photo Notations" show. "It occurred to me that artists probably look through a camera very much the same way that they would approach developing a work of art or approaching a piece of paper or a canvas or whatever they work on," she comments. Esman's "Photo Notations" exhibit was composed entirely of photographs taken by artists working in other mediums. She avoided showing photo-realism because "that seemed so obvious" and instead showed photography related to other kinds of art. "Some of the pieces were an integration of photography and art in as much as the photographs made the art. Some of the pieces were more studies."

Her face suddenly becoming animated, she exclaimed, "The reception was fabulous. Not necessarily in terms of sales," she qualified, "but in terms of critical review and people. It was a new way of looking at photographs. None of the photographs were meant to be photographically professional or beautiful. That was not the point. They were only to catch a moment. Or like snapshot photographs, they were to catch a vision of an artist's eye or an aspect of an artist's vision. So they were not photographs per se." She hopes to keep "Photo Notations" going as a tradition in her gallery.

"Photo Notations" had been expected to remain Esman's singular dabble into photography; but soon after, a museum director referred photographer Christopher James to her. She viewed his work and found his photographs "extremely appealing." In September,

1977, Christopher James, whose work has never before been shown in a private New York gallery, will have a one-man show at the Rosa Esman Gallery; and the gallery, for the first time, will be representing a photographer.

In describing James's work, Esman said "It's kind of the old-fashioned way of painting on a photograph, but he does it in his own way and it's beautiful and I like it." Though she realizes the sales from James's work are not going to be too great, she feels that, "You have to do things that you like, not merely for the sake of bringing in money, although it helps."

Regarding the possibility of representing other photographers in the future, Esman thoughtfully offered, "I would be more interested in photography that transcends photography in a way that I feel Christopher is creating small paintings." Photography, she feels strongly, is worth looking into and "has a validity," but, she observes, "I would like to see it more related to what's happening today. I can go and look at classical photographs at a photography gallery, which I think are beautiful, and I wouldn't mind owning them or showing them, but I don't think it is my particular role for photography today to do that."

MARILYN PEARL GALLERY (29 West)

Marilyn Pearl represents one photographer in her gallery, Marvin Lazarus, who is treated as a "regular gallery artist." She quickly asserts, "He's an artist and his art happens to be photography. I am particularly interested in his photography because it relates very closely to painting and sculpture." The connection is obvious: Lazarus has photographed famous painters and sculptors over a number of years.

Marilyn Pearl did not really think she would be taking on any new artists in the near future. "It's very rare that I find somebody whose work I feel enough of a kinship for that I would take him on." And her feeling applies not just to photographers, but painters and sculptors as well.

Though if she *were* to consider taking on a new artist, she intimated that it would *not* be a photographer. "I have a feeling, in all honesty, that photography is a much more difficult thing to sell than painting or sculpture. There are many interested people, but there are not

many who buy, who put money on the line. There are a handful of photography collectors who buy photography specifically, but by and large, art buyers don't buy photography."

A. M. SACHS GALLERIES (29 West)

Abe Sachs opened his gallery in 1964 and decided to specialize in American artists because he felt that "our American artists had become the most important painters and sculptors in the world." Twelve years later, in November, 1976, the Sachs Gallery had one photography show of American photographer Susan Meisalas' Carnival Strippers. The Sachs Gallery now represents Meisalas.

Abe Sachs shyly related how the gallery came to take on Meisalas. Simply, "We had seen her photography. She came up one day and we all liked it so we decided to show it. We not only sold the photographs, but we had her book for sale, too." Though the show was successful and did much better than expected, the gallery has not yet made a commitment to photography. The staff is divided on the subject. Abe Sachs feels that "it's a great form of art" and certainly has a place in an art gallery. If he were to deal in photography, he says he would like to show some of the photographers of the past such as Brassai as well as those of today. He would like to do what he does with painters, that is, show unknowns and knowns.

Sachs spoke of his inexperience and he is most inquisitive about the pricing and marketing of photographs. "I think it will be a trend and if it isn't, it should be. The point is, we don't know how to market it as yet. We think it has to be marketed differently. Since we're neophytes at it, we think it's more difficult than paintings. We'll have to wait until we know enough about it, until we've seen enough photography."

ZABRISKIE GALLERY (29 West)

A bristly woman graced with a soft-edged friendliness, Virginia Zabriskie is the strong, guiding figure at the helm of the gallery. Zabriskie Gallery's orientation has been faithfully circumscribed around painting and sculpture and Virginia herself pegs it as "a straight art gallery." In the gallery business for 22 years since she first opened her place at age 25, Zabriskie

admits to being in the photography business only six months, and has little expectation of plunging into showing photography except in "a small way."

Last year, Zabriskie showed color photographer William Christianberry's work, but she has a most pragmatic view. "If you sell 15 Bill Christianberry's and you're working on \$100 an image and you're working even 50% and this gallery costs \$18,000 a month to operate, it doesn't work. . . . A gallery is a business." *Business* she defined as "basically the quality of exhibition and the choices and what you show and what you feel about art, but it still represents the business. And photographs," she adds, "would not work here." Though she has had other photography shows to date and plans to continue, they will only be "in relation to other things I may do."

For example, painter Ralston Crawford has always been a photographer, and Zabriskie has shown his photographs in relationship to his paintings. When asked, then, if it was a fact that she is *not* repping any photographers per se, she quipped: "I don't know. Are there any real facts in the world?"

The fact is, last year Virginia Zabriskie did not imagine being in the photography business and this year she is, but not on 57th Street. In January, an exclusively photographic Zabriskie Gallery was born in Paris, which Virginia gleefully compares to "having a baby in menopause." About the lower-budgeted Paris location, Zabriskie exudes, "The moment was right." The space that presented itself would not have suited sculpture and she says "I knew the photography scene here. I'm tired of moving one-ton pieces of sculpture. It's very nice to handle photographs physically. And the space is perfect for photography."

Though she is unsure about photographs belonging in galleries the way they are being shown now—perhaps because photographs are a volume business—she anticipates running the less-costly Paris gallery much like her New York establishment in terms of giving a "good deal of attention to the artist, to the way an exhibition is installed, to the handling of the work . . . the emphasis on the quality of the exhibition."

In addition, she feels that the

Zabriskie Gallery will not be remembered so much for what it has done in New York in terms of sculpture, but for what it will do in Paris in terms of photography. "I don't want to be immodest, but I think that maybe it's there that it's pioneering, which I never did here."

Did she feel that the Paris Zabriskie might influence what she showed in New York? She replied, "I don't see becoming a photography gallery. I might use the back exhibition area for a photographic exhibition. It's possible." However, she did think there might be a chance of doing a show combining sculpture and photographs of sculpture that would travel to the Paris gallery. And there have already been some slightly photo-oriented items added to the New York fare. A photography poster of Neal Slavin's "Statue of Liberty" was produced by Zabriskie, and she claims there will be more posters this year, to be printed in calotype and top-grade gravure. A newsletter is being published bimonthly—full of information about Zabriskie's shows in Paris, announcing the new posters, etc.—and sent to all names on her American mailing list as well as translated into French and sent to a European audience.

On the question of whether she felt that there was still a hesitance on the part of well-established New York art galleries to show photography, Zabriskie honestly replied: "I don't really know. They want to see if there is an audience."

Though she is not perusing portfolios of photographers for exhibit at her 57th Street gallery, Zabriskie may be available occasionally to look over material with a European show in mind. The total concept of the Paris gallery had not yet been completely formulated at the time of this interview, but Zabriskie suggested that her inclinations may well lean primarily in the direction of seeking out and showing European photography.

MARLBOROUGH GALLERY (40 West)

In this newer, more modern, 57th Street edifice, from the time one steps off the elevator into the mirrored corridor leading to Marlborough's reception desk to the time one enters the sparse, vinyl floored, white-walled, spacious exhibition area, one knows this is a very

proficient, well-established commercial art gallery. But it's one of cold sophistication.

Marlborough has been squarely charted in the art world for some time, but has only recently made it onto the photography map. Amid much controversy about a year and a half ago, Marlborough entered photography with a major exhibition of Richard Avedon's work. According to photography curator Paul Katz, Marlborough had been thinking about photography for a long time, maybe four to five years, before the Avedon show ever opened. In fact, just a year earlier, Katz began working for the gallery specifically to help initiate photography because "I thought it would be good for them," he says. "But it wouldn't have happened if people in the gallery weren't interested in it before."

What prompted Marlborough's interest? Katz initially remarked: "It looked like they could make money, some possibilities. It's a very small market, photography." Later in the interview, he elaborated. A large gallery, he feels, can easily do shows to attract the public out of "good public relations" and not intend to make any money on it. "But it's a much healthier, realistic thing if you go out with the idea in mind to try to really sell the material, get people interested in collecting."

The justification for opening with a show like Avedon's and creating such an explosive hoopla was apparently precisely to draw a lot of attention in order "to make subsequent things more possible to do." After showcasing commercial photographer Avedon, the gallery did a small show followed by another major show of works by Berenice Abbott, "a very solid citizen in the photographic community," says Katz. His hope is to continue to expose work he believes is really good, "worth having" and "worth looking at." He claims, "I wouldn't do anything just for the sake of appearing to be even-handed, just to do a show of a young photographer to show we're good guys." Even if the individual exhibitions do not please everyone, Katz is looking to create a cumulative effect that is positive.

"I think a lot of people feel that a gallery—especially this one—that comes into photography takes something away from someone else, hogs in. Other people have done all the

hard work and made all the sacrifices and someone else is coming in to take the gravy off the top, which is a tremendous misconception. There isn't any gravy in it yet. And there might never be. There's an evolution. If we didn't do it, someone else would have done it. Someone else will do it. Next year will be different from this year," says Katz.

Marlborough today represents eight photographers: Berenice Abbott, Richard Avedon, Bill Brandt, Brassai, Robert Frank, William Garnett, Irving Penn, and Maurice Tabard. Agreements with each photographer vary and are worked out individually according to "what they want," says Katz. "Sometimes it's to their advantage to consign work. Sometimes it's to their advantage to sell it outright." Most are exclusive arrangements, with the exception of Berenice Abbott, whose representation is shared with Harry Lunn's Graphics International.

Besides showing the work of the eight prominent photographers, Marlborough does smaller exhibits of 19th century topographical photography and not too long ago, Louis Faurer's prints were exhibited. "We're hopeful that people will see these things and like them," exclaims Katz. "We still have to take chances. If you don't, if you play it too closely to the chest, you don't get anywhere." However, he claims, "we're not interested in showing anyone who is too modern." He seems to feel that the gallery is not closed to young photographers, but would rather exhibit unknowns of another period, which would perhaps be of greater service. "There are plenty of 19th century photographers that people don't know about," says Katz, "and extraordinary people in the '20s, '30s, and '40s.

Katz does look at portfolios for consideration, but has been mostly disappointed. "If I saw something somebody brought in and I really thought it was exciting, I wouldn't have any hesitation about it. I haven't seen anything like that. You see a lot of good things, but you don't see completely realized personalities. There are a lot of people who show me things who haven't even been working for a year, two years, they haven't done the groundwork. No really great work is in the bin yet. They haven't made the great sacrifice yet. Of course, it's easier to see things that are sort of swallowed in the past. It's difficult

to see something that's kind of emerging. I'm not so sure I can do it."

Photography is a field still under cultivation. "You're anticipating a market that may or may not exist some day. You hope that when that day comes along, you have already made a kind of place for yourself and so you'll get a certain amount of activity because of the groundwork you've done. We're still in the stage of doing a lot of groundwork," admits Katz. Although Marlborough has had good sales on the large exhibits, he says, "I'm less interested in the individual large collectors than I am in seeing an expanded popular market, where a lot of people buy a few prints each. Obviously, by doing these large shows and handling people like Brassai and Brandt, the appeal is to a pretty broad range."

Paul Katz is a painter-turned-architectural-photographer and museum photographer with a background in art history. Did he feel that perhaps his personal interests might be slightly compromised by the influence of the Marlborough conglomerate? "Being more frank about it than most people would be," Katz replied, "All galleries, if they pay rent and hire people and sell, are businesses. I don't think this is any more or less a business than any of the others. . . . Everything's untried in photography, relative to the art business. Even the most established figure—Brassai, Brandt—is untried because no one knows before taking him on if he can produce, generate sales. What's needed in the field—when we came into it—is someone making a gesture of 'yes' this is an art gallery: we're doing these shows. It isn't anything cynical. I really believe that Brandt is better than most young photographers coming up. I think he's a great photographer."

Photographers in general, Katz believes, have suffered from a kind of inferiority complex and he intimated that Marlborough's acceptance of photography has been of vast satisfaction to photographers' egos.

For their photographers, Marlborough publishes catalogs of exhibitions and shows their work on a relatively regular basis. Most, Katz calculates, can live off of their sales. The exceptions to this generalization are caused by a photographer's own inclinations. William Garnett, for instance, just does not make that many prints. He wants to do as much work as possible before he gets involved with selling prints in a very serious way. And neither Penn nor Avedon lives from his sales; both are extremely successful commercial photographers.

Some artists, Katz observes, "Sincerely don't want to become involved with art galleries. They don't want to get involved with the whole thing. They're people who only show in museums or produce very little or are very careful who they sell their work to. And that's very honorable and that's really terrific." Artists who are represented by a gallery usually want someone who is sympathetic to the work, but "basically when you take your work to a commercial gallery or show your work in public, you want to sell prints. And there's nothing wrong with that."

ALLAN FRUMKIN GALLERY (50 West)

The Allan Frumkin Gallery in Chicago is well known for its photography, but not a single photograph has been displayed on the gallery's New York walls. "The reason photography is being shown in our Chicago gallery and will not be shown here," says Allan Frumkin through an unyielding Cheshire-cat grin, "is because Alice Adam and Carol Taylor, who is her assistant and soon-to-be-director of the gallery out there, are both very interested in photography and they wanted to get involved."

Photography does not "engage" Allan Frumkin and he is interested only in the sense that "if it's something that people I am working with want to do then I want to do it. It isn't something that interests me personally." His lack of response to photography as an art form, he says, is attributed to the sensibilities formed while growing up in an atmosphere of abstract expressionism: "I really have never been able to come to terms with the surface of photography, of the photograph," he admitted.

Nor has Frumkin ever had the desire to own a photograph, "never." He has



some idea of who's who and what's what in the field and is interested by certain photographers' work—"Les Krims and Duane Michals are both the kind of guys I really relate to"—but he still feels "painting remains the central art—visual art—of our times." His current "hot" interest is in ceramic sculpture.

Most art dealers are in the field because they like—or even love—what they do and are involved, says Frumkin. "It's very dumb to get into things that you're not very interested in. That's really counter-productive in the long run. The hardest thing about being an art dealer is to rekindle your interest in what you are doing and keep alive and keep yourself sort of 'juiced' year in and year out. And if you're dealing with stuff you really don't care about, you can't do it."

Though the New York Frumkin Gallery apparently will never play host to photography, its relative in Chicago is still receiving Allan Frumkin's distant encouragement and seems destined for continued success.

JUST ABOVE MIDTOWN GALLERY (50 West)

Just Above Midtown Gallery has been just above street level, occupying a small space on the second floor of the 50 West building, for three years. Run by young, vivacious Linda Bryant, the gallery is devoted to showing "living, new and emerging American artists," with particular emphasis on the style of "conceptual minimalism." Bryant admittedly had no interest in exhibiting photography until late 1975 when she was approached by a group of photographers intent on convincing her of photography's merits as an art form. Initially, she was extremely reluctant to exhibit photographs in her gallery, but after actively researching the history of photography and listening further to the group's arguments, she acquiesced.

Photography made its debut in the Just Above Midtown Gallery in January, 1976, with a group show of photographs by Adger Cowans, Al Fennar, and John Pinderhuss. The reception was "fantastic," exclaims Bryant. By October, 1976, a second show was organized of four-color Xerograms by photographer Joe Harris. And in January, 1977, the gallery's third photography show of David Lampson's photographs took place.

Bryant promotes the photographers

"consistently," but has chosen to represent them to a lesser degree than her other artists. "Quite frankly," she admits, "I've had a hell of a time marketing photographs." As a dealer, she wishes she could "translate the enthusiasm of the viewer into support in the way of buying." The clientele attracted to her gallery to see—and buy—other types of work, she feels, is different from the audience interested in photography. Photography galleries, she recognizes, have developed a clientele for photography in a much more sophisticated manner.

For an art gallery such as hers, Bryant believes that the viewer needs to be more educated in looking at photographs; she confesses to going through somewhat of a learning experience herself. Essentially, she feels that photography is "like an embryo" in need of developing certain criteria to be a complete art form. Bryant calls it "qualitative criteria" in which styles must be defined, aesthetic judgments made, and a criteria for technical competence established. Photography has hit the marketplace without the same kind of already-developed features of a fine art form, she feels, and people are having difficulty accepting it. Viewers enjoy it, but continually react with an offhanded "oh-I-can-do-that" response much like the reaction art dealers got selling abstract expressionism back in 1945.

For art dealer Bryant, the problem today is that photography is just not selling well. The last show "killed" her financially, and after that fiasco she had been determined not to show photography again. However, in March, a young photographer from Iowa wandered into her gallery and suddenly changed her mind. His work intrigued her in that it related to the kinds of conceptual things she has been showing in other art forms and in spite of her adamant position to avoid having any more photography shows, she reconsidered and scheduled the young Iowan's work for exhibit during the '77-'78 season. And though Linda Bryant would very much like to, she has "not stopped looking at photography" and chances are she never will.

POSTSCRIPT

Rumors have been circulating rapidly throughout the photographic community concerning the sale of two of the

prominent galleries situated on 57th Street. We decided the stories needed to be investigated.

The Witkin Gallery was the first to come to our attention. Rushing to make our publication deadline, we urgently telephoned Lee Witkin, who was unavailable for firsthand comment. Through his assistant director Courtia Worth, we were told that for a long period of time, Lee was seriously considering selling his gallery. Worth said he had been anxious to get away from the expensive overhead, the large staff, etc. At the time, however, no viable alternatives presented themselves—in other words, no particular buyer appeared—and Witkin has since found "other routes" and "other projects" to pursue. Basically, Worth says, the answer about selling the gallery is "No. He's not." Worth did mention, however, that the gallery "may or may not still be up for sale in principle, but in actuality whether Lee would ever sell the gallery is another story."

The second gallery rumored to be up for sale is Light Gallery. After a phone call to Light's owner, Tennyson Schad, we report that the rumor is absolutely false. Schad's answer to the question of a sale is a "categorical, unequivocal no." Selling the gallery, he says, "never crossed my mind." He guesses that someone perhaps misunderstood what he had said at some point concerning "internal changes" in the gallery. When asked what kind of internal changes he was anticipating, Schad replied: "They're all good. We're growing too fast to keep up with what's happening," but he could not talk about specific details because everything is still in the preliminary stages right now. He is steadfast about not looking to sell the gallery. "There is no way I would give it up," he affirmed.

AUTHENTICITY AND LIMITED EDITIONS

Photography is relatively new to the art marketplace, but already problems inherent in the medium are surfacing. Authenticity and editioning are two of the "horrendous problems," warns Allan Frumkin. "They're just nightmares."

Already, a major international art dealer has produced a catalog that featured five prints attributed to André Kertész that Kertész claims were not originals. Kertész points an accusatory finger at the "so-called serious dealers"

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who, he says, are "inundating the market with copies." One should be sure to check as to whether the vintage prints are real or not, Kertesz advises. He would prefer that the people who buy his material bring it to him to check and identify. Kertesz further suggests that gallery directors who sell these materials be responsible for controlling the problem: they, and not the buyer, should establish authenticity.

The second problem is editioning. Limited editioning, which can have a vast effect on pricing, has raised a shocking amount of controversy. In 1971, Lee Witkin teamed with Dan Berley to make available a handsomely boxed, small collection of a photographer's work at an attractive price. (Portfolios were by Weston, Uelsmann, Brassai, and Larigue.) Witkin says "It was done out of love and involvement in the field to do something fine, something beautiful." But, as is often the result, the idea snowballed and today Witkin disgruntledly comments, "Everybody and his grandmother are doing it. To the point where it's so inundated; people don't know what to buy."

But limited editions were really done long before 1971, in a sense. Naomi Savage's copper work, for instance, has been produced for years in a limited edition of one, simply because of economics. "Instead of a 10¢ sheet of paper," says Naomi, "I waste an 11x14 sheet of copper and it's \$100." Some of the photographers at Light Gallery as well tend to work in self-imposed limited editions, but for other reasons. Because his full-time position as director of the University of Arizona's Center for Creative Photography limits his time to do his own photography, Harold Jones will make a certain number of prints from negatives of the same year and then stop. Photographs made in 1976 are printed in 1976 and he will send them off to Light to sell. Director Schrager calls it "an organic edition" that consists of two of one image, eight of another, etc. "Benno Friedman makes unique prints," adds Schrager, "but for the portfolio that we did, we made ten sets that are each hand-manipulated, but each is different. So I don't want to call them unique because they're companions to it. But I don't want to call it an edition of regular prints because they're all different."

Bob Persky at Images talks about his decision to "go the route of limited editions signed by the photographer and

numbered" as something borrowed from the graphics industry. "If you really want to sell a piece of art, the head of the art-buying public seems to want to know that there are a finite number in existence," says Persky. "I think that any photographer who violates the limited edition concept is just going to destroy his own marketability." Persky explains that the matrixes (from which dye transfer prints are made) are *not* destroyed, "because the transparency exists and the photographer retains the right to use that in a book or in a magazine or something smaller than an 8x10."

Thus, limited editions raise the question of what to do with the negative. Gene Smith is "skeptical of those people who run around and make 100 prints and tear up the negative. In fact," says Smith, "I think it's downright foolish." Smith is making a limited edition portfolio of 25, "but this does not mean that I'm going to destroy the negative or anything. I didn't make it for 25 people." Smith strongly believes that destroying the negative is "anti-photography and anti-human-being and strictly appealing to the lowest grade of snob in the art world. And this is my greatest criticism about the whole damn collecting business. I think too much of it is snobs instead of art lovers or photographic lovers or human-being lovers. And I would have no part in it."

Virginia Zabriskie agrees that editioning is "anti-photographic" and dislikes the concept immensely. "I think you've got to look for a new audience for photography. And that audience has got to be young. It's not going to be elitist. And this whole idea of editioning is elitist."

Resting on the extreme opposite fence is Paul Katz. "I'd like things to be as limited as possible because there are three factors that tend to determine the value of any work of art," says Katz. "One of them is rarity and the other two are historical and aesthetic interest. The three things converge and you have a real art commodity. If they don't, you have problems." Sophisticated collectors, Katz feels, will balk if prints are unlimited and "this has been a traditional stumbling block in selling photographs." Photographers seem to be caught in the middle. Most photographers work with the mass media. Marlborough's artists, too, essentially work for the printed page (e.g., Brassai, Brandt, Avedon, Penn,

Frank). "But," says Katz, "they never thought—at the beginning anyway—of prints as discrete art objects that you would sell and collect." Katz feels these artists have to rethink "whether they're up to what they're doing." But older photographers, he continued "don't have too much of a problem. I think Brandt and Brassai and Abbott, their productive days are very carefully circumscribed. There's only so much work that's going to be forthcoming. I don't think there'll ever be a time when there are too many Brandts in the world."

Victor Schrager, though he says he "would never require somebody to do a limited edition or forbid him to do it," seems inclined to get around the whole problem through his internally regulated pricing-system concept. (An explanation of the pricing-system concept can be found under the category "Pricing.") "The only point of having a limited edition is to know how many there are in the world. But why would you care how many are in the world? So you can sell it. So if I give you the same selling benefits and it doesn't matter how many there are, then you're getting the same benefits."

Clearly the time has arrived to examine these problems more closely.

Collectors

Who exactly is the increasingly sought-after buyer of photographs today? "Everyone," says Victor Schrager, "in every kind of situation. From private collectors who are spending large amounts of money to establish very important significant collections; to people who save up to buy that picture and that's the one they need and they go out with it and they won't be back for four years; to people who walk in off the street and say 'that's great, I'd like to buy that.' Or every conceivable kind of museum. A lot of corporate sales. Everyone collects. What I can't tell you right now is what the balance is."

Clearly, though the "collector" has been evolving over the years, people today are certainly collecting for different reasons than the motivation of eight or nine years ago. Lee Witkin looks back at 1969 when collectors were those "who loved photography for years and were starved for a chance to acquire prints. Suddenly the biggest thing was that they would come in and say, 'Wow! I've never seen a real print.

I've seen a reproduction of it. Wow! It's beautiful.' And they would buy."

Undeniably there has been a quantum jump in the number and type of collectors during the past five years. Paul Katz notes that, for instance, art collectors are in photography where none existed before, and their presence has brought about tremendous change. Allan Frumkin elaborates on the point. "A large number of the people who are into photography either were in prints or would have been into prints if the print situation hadn't gotten out of hand. Master prints are very high and even contemporary prints have gotten a little crazy. A lot of people have been turned off to the print and have gone into photography, which is fine."

Yet, photography, Katz feels, "is still a relatively small market." When Marlborough does a photography show, "an awful lot of people come trotting in to look. There's a lot of interest in it. A lot of people take photographs and are interested in the medium. They come and see it and enjoy it and they go back home again. That's a very different audience than a really serious collector." On the scale of things, Katz says there are not too many serious collectors.

Bob Persky is looking, in part, to develop a different kind of collector for his color photography. "I don't think anyone who is a serious collector of Rembrandt or Picasso is going to turn to photography if they are really serious collectors. But I want it to be an alternative." Two of the types of "clients" Bob Persky hopes to entice are the "bank or insurance company that has an art collection" in addition to the individual who "is really looking for something to enhance his own environment, whether it's his house or his office."

Paul Katz cites another kind of collecting: "Most collectors just stick photographs in drawers one on top of the other. That's because photographs still relate. They're very intimate. There's something to opening up a portfolio and looking through a bunch of nice, beautiful Frederick Evans platinum prints. It's a very pleasant experience. And more pleasant than seeing them on a wall."

Finally, Sidney Janis matter-of-factly guesses that there are many collectors. He even feels that some *photographers* have collections that are fantastic, even "greater than any art collector could

have." In general, Janis summed up, "There is a good audience for photography and I think it's growing."

Color photography

Most galleries view the area of contemporary color photographic prints almost as a category entirely separate from photography. Color has not yet been firmly accepted as an art medium in the same way black-and-white photography has been. Mitchell Funk believes the reason lies in color's immediate association with commercial photography. "I don't think people—the powers that be—who write about color are knowledgeable about or open enough to understand. They associate it with making money, shooting bottles, ads, whatever. I don't think they really have a thorough understanding of the medium. It has to get exposure. There've been thousands of articles written about black-and-white, and very few articles discussing color photography as art."

Stephen Shore thinks the problem has been that color has not been very good, so why should people accept it? "There didn't seem to be photographers of good photographic intelligence who were really throwing a lot of their efforts and energies into color until recently," says Shore.

Clearly the range of color photography is beginning to span numerous levels. Shore described one level—simple color graphics such as pictures of a street in Andalusia shot with a blue filter—as being comparable to the art world's tacky-Third-Avenue-painting-galleries' 5,000 original oil paintings. Funk contends that color cannot be "just decorative or superficial," which some of the reviewers tend to think. "Color can also be a strong medium, very realistic as well as a medium of heavy fantasy."

Paul Katz has "a tough time with color because of these Type C prints and the Cibachromes have such a kind of hard, mechanical look to them. They remind me of record album covers. . . . Personally, I'm perfectly happy with black-and-white photographs."

The biggest problem with color appears to be a general lack of education about types of prints, from dye transfers to Cibachromes to C prints. A question that constantly arises is one of longevity. Stephen Shore says, "No color medium on papers is permanent. I have a Japanese print that when exposed to light fades faster than

a color photograph." Bob Persky of Images agrees. "No art form lasts forever. Oils oxidize, prints of all types, whether photographic or printing inks, fade when exposed to sunlight." From his standpoint at an all-color photography gallery, Persky says, "This is not Merrill, Lynch, Pierce, Fenner & Smith. We are not selling securities. We are not selling anything as an investment, other than an investment in pleasure."

Obviously color photography is still in its formative stages and few galleries are yet ready to embrace the possibilities of handling more than a token few color photographers.

Criticism

It is no secret that the photography art world suffers from a dearth of good critics. Both gallery directors and photographers whom we interviewed continually referred to the absolutely crucial need to develop this area.

George Tice mentioned that reviews are widely influential. The fact that Hilton Kramer, art critic of the *New York Times*, started writing about photography has helped expand the medium's public acceptance. But not enough exhibits are getting the kind of reviews they should, nor are the reviews "very intelligent." Tice feels that most people do not rely on their own judgments when deciding to purchase prints, therefore reviews can make a difference. Tice thinks "this is why young photographers don't sell well because they're just not known and not getting that kind of exposure."

Paul Katz blames the lack of good criticism on the publications, the space devoted to photography, and who the writers are. In most instances, Katz thinks, "The people who write about photography just aren't very good writers."

Virginia Zabriskie underscores the urgent need for a body of critics. "I don't know if it will come out of the painting/sculpture areas or whether it will be a whole new group of critics, but that's needed desperately."

Photographic criticism is an essential ingredient if photography is to continue to evolve, grow, and mature. It is something that should directly concern anyone working within any capacity of the medium today!

Exclusivity

Each gallery defines exclusivity differently, usually based on a

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geographic stipulation. Some, like Witkin, offer representation exclusively in New York to be most effective. Others, more active in making contacts and arranging shows elsewhere, feel they can demand exclusivity of a photographer's work over a wider area. Photographer George Tice feels that exclusive arrangements may not be to a photographer's best advantage. He cautions against "arrangements where anything that's sold has to go through the gallery. If a photographer gives a lecture out-of-town and afterward, two people approach him to buy prints, the sale should not have to go through a gallery since the contact was made independently."

On the other side, Stephen Shore and Bill Larson are both with Light Gallery on an exclusive international arrangement and both feel, for different reasons, that such an arrangement is more advantageous in the long run. Stephen Shore claims he gets a lot: "They give me a show every two years and they put together group shows. They handle a lot of work for other shows... so it makes it very easy. They pack the work, they overmat it. If I were to deal with other galleries directly, I would get 60%, if I deal with Light I can get 50%. But for what I save on overmatting, shipping, etc., it's well worth it." Bill Larson appreciates the give-and-take of such a relationship. Certainly, private sales are possible, but Bill thinks "it is to my advantage to do it through Light Gallery. If there is a certain volume of sales that I generate for the gallery, it sort of reinforces their commitment to me."

Sometimes the interest on the part of photographers in being exclusively represented by a gallery is not entirely economic, but also psychological. There is a reassuring feeling in knowing that someone else is taking care of business for you, freeing you to concentrate on producing work. However, Alan Dennis, a young photographer with Images Gallery, seems to have made an about-face on the question of exclusive representation: "It kind of soured me in general. I don't think that for me at the moment, at 25, I should be exclusive with somebody, especially in a new area of art. It sounded great in the beginning because you say 'O.K., great, I'm represented by somebody!' When you're represented by somebody, there is a certain sense of security there, psychologically."

But as with any arrangement, exclusive representation has its

compromises and perhaps disappointments. Each photographer and each gallery director obviously has to weigh the pros and cons before signing any kind of exclusive contract. For each, the agreement must provide a viable, workable arrangement allowing a photographer the "luxury" to live and photograph while permitting the gallery director the chance to make a living selling the results.

Openings

Photographic openings have almost become for photographers what "coming out" parties are for high society debutantes. Though an opening typically welcomes a first look at a particular body of photographs, few people flock to the gala to see the pictures, but instead to be seen themselves.

The assorted crowd usually consists of many of the same faces, from photographers, camera press, friends of photographers, or gallery people to photo groupies. The event is social, but with burdensome overtones of making "contacts." Wine and cheese is often plentiful, varying in quantity from gallery to gallery.

Witkin admits he has openings because of the "social obligation," and "that's it. It can be pleasant; it can be dull. It can be anything depending on the chemicals."

At Light Gallery, one chemical has been for the most part eliminated since their relocation—alcohol. "The openings at the old place were sort of big drunks," Victor Schrager bemoans. So openings have changed at Light; they are more like receptions now than parties. Victor much prefers "the Saturday afternoon with artists and you come to look and to talk." However, occasionally an evening opening with alcohol still takes place.

Bill Larson views them pragmatically: "Nothing significant intellectually comes out of openings and there's no serious looking. Openings make the artist visible for a few fleeting moments and if anybody chooses to see who makes the stuff on the wall, maybe that's all right. Most people are a little bit shy about expressing feelings about you or your work." However, Larson did add that "it's nice to have friends around to go through something like that—it's like birth and marriage."

Photography—an art form

As a result of the established art galleries and auction houses jumping onto the photography bandwagon, a

sharp comparison of photography versus painting (and other graphic mediums) has begun to be drawn. Is one really talking of semantics or snobbery? Whatever the motivation, photography's presence on the art scene demands a reassessment of the art form in general.

With just a hint of condescension, Allan Frumkin benevolently observes: "I think you view people as they ask you to view them. In other words, photography galleries represent their work as a kind of fine art, or whatever you want to call it. All right, if they ask for that kind of response and you give it that kind of response, then you judge it on that basis. And if they present it differently, you judge it differently. Since I am not wildly sympathetic, obviously, I tend to side with the ones who take the other attitude—the much more elementary, the less art-oriented attitude."

Virginia Zabriskie claims that photography expands visual art. "The vision is very different in photography than it is in painting. But I will not go along with people who say that an art background has no place in photography. It's a little bit Museum of Modern Art approach, I think. All of seeing is related and there are visual sensibilities. Looking at painting is different from looking at photography." She does concede that it is very hard for a photograph to compete with a painting and therefore feels the portfolio idea is good.

Allan Frumkin philosophizes on the "real" reason for the current acceptance of photography as being directly related to the climate in painting. During an earlier period, painting dealt with a certain type of excitement through brush stroke and surface modulation, but this is not one of the current issues in painting today. "Painting has reduced its surface character and its surface quality to such a point that photography can in a sense compete at that level."

Victor Schrager is annoyed with the comparison. Photography is what it is and he resents the pressure. "I think the measure of success in photography is quality. And quality being a measure of something that comes from the photograph. The quality of a photograph as art is not in its proximity to other things. A painting has to do certain things to be a good painting. A photograph has to do certain things to be a good photograph. Photography is art; photography is not painting. People always ask the difference between photography and art. The difference is

the same thing between painting and art. Not all paintings are art, not all photographs in the world are art."

Gallery directors tend to differ on the economic considerations of "photography" versus "art." Sidney Janis says, "It is not like painting on the level that a painting can last 100 years and when it's restored, it'll last another 100 years. Photography won't." However, Bob Persky does not think "photography has to be defended because it is not the most permanent thing." If a print costs \$30 a year to enjoy before it begins to fade, then Persky feels that is "something wonderful."

With the handling of photographs, directors are discovering a definite advantage over other art forms in terms of traveling exhibitions. Obviously photographs can travel far easier than sculpture or even some paintings: physically, a show of photographic prints is much more readily transported to a distant gallery. For the photographer, the possibilities of greater visibility on practically any continent can make one's reputation international.

Photographers, while at the same time enjoying all the attention, are irritated by applied labels: Is it preferable to be called "artist" or "photographer?" Stephen Shore is adamant that the best photography is not done by people who call themselves photographers. He says, "I find that in terms of my taste in photography, Light Gallery has already blurred the distinction slightly. They have photographs that are made on sensitized satin, photo collages, and that kind of thing that has been done in art for a very long time. And I don't see any reason why it should necessarily be called photography. I don't see why it should necessarily matter."

Duane Michals sums up the dilemma. "I know a photographer who was recently approached by an art gallery and he showed his work and they said they were interested in his work but he would have to decide if he was an artist or a photographer. If you're a photographer, you're worth \$200, if you're an artist, you're worth \$500 or \$1,000."

Pricing

Pricing has become a rather curious and significant issue. Its influence may well be responsible—in part anyway—for the change in climate from what Lee Witkin fondly recalls as "small, friendly, good feeling" to today's atmosphere of

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The power of pricing is not something to be passed over casually. As Duane Michals observes in his comically incisive way: "People are so unrealistic about power. . . . Artists have no power. Gulf Oil has power." Prices wield power. "If photography really becomes very expensive, then dealers will have power."

Certainly the reaction may be extreme, but let's examine the issue in more depth. Photographers claim they set their own prices, some in collaboration with the galleries that handle their work. However, photographers—by and large—still experience a kind of naïve joy when someone buys one of their prints. Michals' confession is typical. "I'm still delighted to sell anything. I think it's marvelous that somebody would pay me money for my print. It's very flattering." Thus the concern arises that if there is such a sense of delight, does the photographer not end up dealing with price setting only in terms of an ancillary function of selling, which becomes for the artist a paramount compliment?

Gene Smith admits he is ill-equipped to get involved in prices and "vaguely sets them and runs." He declares: "If they put me in the dealing position, I would end up by giving away all my pictures. I'm very uncomfortable being involved with money matters." Fortunately, Gene says, Witkin has taken much of that off of his back.

André Kertész voiced a similar sentiment. "I am not commercial minded," he announced in his thick, charming accent, and has in the past had to ask for advice on pricing. But today, André is distressed by the advisors who do not seem to recognize the difference between artistic value of material and monetary value. Since prints have become fashionable to collect, he feels that people are only looking at photography out of the money interest and not out of love. (In fact, Kertész was so disturbed at the way some of the galleries handled his work "to build their own reputations" and sold his work cheaply in order to sell more, that he has since abandoned being represented by a gallery and instead sells his work himself. "I am not a merchandise," Kertész insists. ". . . I do not want to sell my material like in the *épicerie*."

In general, then, who really sets the prices and what are the criteria? Numerous variables appear to be at the

controls. Paul Katz complains:

"Unfortunately, we don't determine the prices ourselves. It depends upon what we have to pay; what the people have been getting in the past for the prints. We just take it from that point and see what happens." Each photographer is a different price case. Contrary to public opinion, Katz assures, "We have no interest in having high prices. I'd like the prices to be so low that the market would absorb everything we have to sell. That would be the ideal situation." If he had his druthers, he says emphatically, "We'd sell material as cheap as we possibly could without undercutting other people in the field."

Victor Schrager says he works out prices with each photographer, but bears in mind that "I'm the one who has to deal with it everyday." There is a long list taken into consideration including: "The way the prints are produced—some people have an easy time making them, some people, like Frederick Sommer, have an unbelievably difficult time; the number in the world; how well they sell; whether they seem to sell better at retail in New York or to other dealers; whether they are limited editions or whether they are unlimited; whether the photographer is alive or dead; whether his print output is finite or infinite."

For Abe Sachs, pricing Susan Meisalas' photographs was a major problem, since Susan is the first photographer ever to be represented by his gallery. Sachs lacked experience about prices. His solution was to ask Arnold Newman what *he* charged and Sach's decided that since a well-established photographer like Newman gets \$250, Meisalas' work "shouldn't be more than \$100."

Victor Schrager talked freely about a new concept for a pricing system at Light to avoid ending up in the "business of selling golden oldies." Instead of pricing everything across the board, he is "starting to make concessions to reality." Using Harry Callahan's work as an example, Victor explained: "If you want 'Eleanor in the Water' or some of the very popular prints, fine. They're here. But they're going to be more expensive. What this is going to do is give people an incentive to look across the board and see everything that's done. It's going to make the rarest print by Callahan the cheapest." Besides giving certain prints liquidity in the market, as though they were limited, the concept allows photographers to do new

work. Arnold Newman welcomes the idea. "I don't want to go back and make old prints again. So people who want my old prints are going to have to pay for me to go back and make old prints. I want time to work on new things." And even though Stephen Shore does not make his own prints, it takes a lot of time to get them printed right, which often calls for returning to the lab several times. "I just don't really want to spend all that time. I'd rather sell for more," said Shore.

Within a gallery framework, the escalation of some photographers' prices seems to have a direct effect on others. Bill Larson calls this the "grandfather clause," which he thinks is very helpful. "Those that sell all the time sort of escalate the price of us who don't sell that much." Somewhere down the line, Larson will be doing the same for the younger people.

Price escalation is in part affected by such a structure, and in part by other influences. Paul Katz perceives "cycles of interest" in certain objects because of "their importance in the history of the medium or because of their aesthetic value or rarity." It only takes three people who want the object very badly to drive up the price, Katz declares.

Witkin believes the rapid price increases have to do with "the fact that major galleries have to sell material that brings in a certain minimum price. They can't sell prints for \$50." Lee, on the other hand, does have prints available for \$50, but which, he cries, "nobody buys. People are very funny. They'd rather spend \$1,200 for [Ansel] Adams' prints than \$150 and they'd rather buy Imogen [Cunningham] at \$60 than \$25. There's a certain psychology, unfortunately, that works upon some kinds of people that the more expensive it is the better it is." Witkin feels that this not only affects the collector; the photographer, too, is led to believe that he is only as good as his price. Duane Michals feels similarly, especially concerning young photographers who are totally unrealistic. "These kids who have their first show are charging \$200 for a picture of their mothers and nobody is going to buy their work."

As a result, Gene Smith's prices have been directly affected and had to be upped recently from \$200 to \$400 and then to \$600 (depending on size). Simply, it was unreasonable for such a celebrated artist's work to remain priced lower than some of the newcomers appearing in the marketplace. Witkin has

valiantly tried to leave pricing up to Gene: If Gene wanted to leave a price at \$200, Lee never pressured in either direction; or if he wanted to charge \$1,000, that was Gene's prerogative. (Smith says in his inimitably witty fashion, "The responsibility of making a \$1,000 print is too much.") The collecting market seems to be the dictator of pricing. Generally, Smith hates these prices. He says, "I really photograph not for collectors but I photograph for a lot of people."

Naturally, gripes are echoing in the halls of the print buyers about high prices as well. Especially sad, as Sherry Suris notes, are those buyers who, in a sense, helped build Witkin Gallery eight years ago by buying prints when it was not in vogue to do so, who, today, cannot afford print prices.

Arnold Newman dismisses the validity of such an argument. "Photography right now is probably the only art medium in which you can buy masterpieces by masters that are comparatively very, very low." Besides, Newman says, he has been chagrined to overhear people in photography galleries complaining about high prices while in the same breath discussing a fancy \$40 dinner. All it would take to buy a print would be to sacrifice a few expensive dinners!

None of the gallery directors could honestly venture a guess on where prices would finally stabilize. Lee Witkin would like "a leveling off so that one could look ahead five years with some degree of stability and feel that things would keep going along the way they are." The gallery directors hope for a real market, not one that will go up and up. And a real market is not all-inclusive. "It's like the art market does not include every artist who paints," observes Paul Katz. "It includes a relatively small number of artists and a small percentage of prints from the past that are sufficiently desirable for enough people so that they are constantly being bought and sold. You have a market. You might have the same thing eventually in photography. That's what I'd like to see happen. Not that prices become astronomical."

Sidney Janis feels that photography print prices will never command the prices of paintings anyway, "merely because the life of a photograph is limited. It turns black. It discolors. It disintegrates eventually." Virginia Zabriskie, however, is unconcerned about longevity and when clients come in and ask if their \$100 photograph will

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last 10 years, she remarks glibly: "That photograph will look better than you 10 years from now. And if you buy a suit at Bloomingdale's for \$100, you don't ask that." She does concur with Janis in terms of photography maintaining a relatively low price structure. Her reason? "It's a multiple item," she stressed. "Therefore, its pricing must be according to that." There is no way, she feels, that Harry Callahan could ever get \$40,000 for a photograph similar to what Frank Stella can get for a painting.

"You're dealing with numerical numbers," she says, "and you've got to deal with numerical numbers because you're dealing with volume." She suggests that perhaps photography could eventually be more lucrative in terms of publishing portfolios or through heavy contractual arrangements with photographer/artists.

Light Gallery already seems to be moving in such a direction. "We're an innovative business," says Schrager, so Light is putting together "investment syndicates." He explained, "From time to time there are people who want to set aside large groups of pictures to be sold in the future. It's a way of getting photographers guaranteed incomes exclusive of their sales here." Hypothetically, the way this would work is, say, for a group of people to get together and buy outright 250 photographs by André Kertész at a set price to be paid immediately with the stipulation that none of those 250 could be sold for a set period of time, say, 15 years. "In a sense, it's good for the gallery," says Schrager, "because it guarantees us a future. It's just a different kind of selling, that's all."

At this point, photographic print prices range from \$100 to \$8,000 (for a rare vintage print). Certainly an unhealthy undercurrent exists concerning "manipulators," of which both Witkin and Katz seemed painfully aware. Witkin talked of "people getting into the field with big money to sell and to distribute—big money operators who are trying to make a killing in photography." And Katz referred to "manipulators" who have a "definite desire to affect public opinion." Everyone wants to be a taste setter, he feels.

Finally Duane Michals takes a long, hard look into his crystal ball and predicts: "One of the things that is going to save photography is that it will be accessible at reasonable prices, which is terrific." Paul Katz agrees: "It's one art form that everybody can collect. You can go to a flea market in the country

and find a nice daguerreotype for \$5. I think it would be sad if the time is gone when a person could have a nice photograph."

Young photographers

Photographers have produced work quietly for over a hundred years, but it is only within the last decade that photography has aroused so much attention. With the added possibility of more financial reward than ever before, the medium is attracting more and more hopefuls each year. Photographers of the '70s appear to be a much different breed, with different goals and values.

Arnold Newman derides people who are doing photography for the wrong reasons. "They haven't sat down with someone like David Bailey. What they don't know is that he's a damn hard-working guy who sweated a long time, who works hard, who is still very intense, who still gets excited about his art. At these photography workshops, they want to know the secret. There will still be people who won't believe that it's hard work."

The emphasis on "paying your dues" rather than just expecting the lofty position of recognition is reiterated by Duane Michals, who comments, "I am very realistic because I work in the real world and I also do my own work so I am very level-headed and I see both sides of the spectrum. All these kids in art school, they're equipped to be Cartier-Bresson and to show at Light; they don't know anything about the photography business. They simply don't know anything else. It's very sad in a way. They ask how can I do commercial work—I love it! Commercial work saves me because I simply do not have to produce work to make money—my private work. . . . I think the moment you start living off your personal work, that's another whole type of arrangement. It's simply not what you are doing—you're turning out a product at that point, so the relationships change."

Gallery directors are discovering unmistakable differences in dealing with "aspiring" photographers; they are a more knowledgeable group and expect a great deal. Lee Witkin generalizes about "a whole new breed of young people trying to make it with a certain arrogance and ego." Lee recalls, "When I started out, people like [Edward] Steichen and Imogen [Cunningham] and Ansel [Adams] were unrepresented in this nation. They'd worked for 50 years and they were very happy to sell their

prints. Now that photography is big time, you get all these young twits who take a few pictures and want a book and a show. We did give our time (to look at portfolios). This was a courtesy thing and we were getting nothing but resentment and flak from people who thought they should be told they are the greatest things in the world. They wanted to hear what they wanted to hear; they didn't want to hear what we said."

Virginia Zabriskie also recognizes a terrific difference in the personality of the artist/photographer. "They are more outgoing. Along with that, in all of my business life I have never seen a painter or a sculptor with a business card or stationery. I never met an artist in my life with a letterhead until I met a photographer. And nobody in 22 years ever handed me a calling card. Photographers are much more business."

The most important advice to young photographers, repeatedly offered by both directors and well-known photographers, is to slow down and be patient. Duane Michals cautions: "A lot of these kids want to be seen now and if they were, it would be very inappropriate. They would nip themselves in the bud. . . . there is a danger in not ripening." 

ANYBODY CAN BE A CRITIC *continued from page 43*

personal style, a new vision of beauty and photographic truth.

Q. Thank you for clarifying the meaning of these photographs.

A. You're quite welcome. To simplify matters, I've purposely omitted mentioning such things as frontal planes, deep perspectives, the interrelation of forms, and negative and positive space. As you know, photography is such a complicated subject that the average person can't possibly comprehend all of its multitudinous meanings.

Q. You're so right. By the way—judging from that camera you're carrying, you must be something of a photographer yourself.

A. Really, now—modesty forbids! Actually, I don't do much picture-taking because I'm all thumbs when it comes to putting in the film. How about helping me load this darned thing?

Note: Many of the critical phrases used in this interview were lifted (out of context, of course) from the writings of recognized critics of photography. 

down to 23 feet and the Spiratone 500-mm mirror uses 77-mm filters over the front of the lens. It would be nice if the Vivitar 600-mm could crank in a bit closer, and it could get expensive with the Spiratone 500-mm if you are a filter freak.

If you think that a supertele (mirror or otherwise) will magically solve all your problems when shooting at objects at infinity, you are in for a horrible surprise. First of all, we are under about 15 miles of atmosphere when standing at sea level. Add to this all the pollutants (man-made or otherwise) continually being mixed in, and have the whole mess stirred by the sun, which causes thermals to rise and objects at a distance to quiver and shimmer; the result is that the days when you will pull in ultra-sharp shots a mile or so distant are few and far between. However, the cat lens also gives enormous image magnifications at the shorter ranges. It is far more comforting to confront a charging rhino with a long lens from a few hundred yards away than it is to use a moderate tele and hope to leap out of the way before you get creamed. Likewise, shy subjects are not disturbed by the thunk of a mirror rising when it is 70-odd feet away. If you really want high magnifications, the addition of either a tele-converter or extension tubes will help a lot. You must, of course, be prepared for some loss in lens speed when using a converter or an extension tube. Also, first test to make sure that the extension tube does not cause corner-vignetting with the lens of your choice. When shooting with negative film, this scarcely matters, but it can be a bore when it turns up on your irreplaceable slides. The neat thing about an extension tube with a supertele is that you can take full frame shots of a bullfrog's eye without having to stand up to your neck in smelly old swamp water.

I shot some wonderful transparencies of the dull red ball of the sun setting over a swamp by adding a 2x converter to the already long 2,000-mm Nikkor, thus boosting the focal length to 4,000-mm. To look at the sun with such a rig is to look into the mouth of a furnace. A word to the wise at this point: do not point any supertele lens at the sun without the appropriate sun filter over the front of it. A neutral density filter in the lens light path will *not* do. Filters have been known to shatter under the thermal load, and since a mirror lens passes practically all

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of the infrared, you can be instantly blinded! The human eyeball has no internal cooling system to carry away the heat, and a blast of sunlight focused by a mirror lens can turn it into a hard-boiled egg in quick time. The sun filter is a surface-silvered glass that goes over the front of the lens and reflects the heat away from the system. When you consider that 4,000-mm will fill the screen with about one quarter of the disk of the sun, it pays to treat it with respect.

You will notice that most superteles, and mirror lenses in particular, will rack in behind the infinity mark engraved on the focusing scale. One reason is that infinity is assumed to be x times a lens's focal length. Once this distance is exceeded, an object at "infinity" is generally regarded as reflecting light rays virtually parallel to the axis of the lens. Since it should be obvious that any object (no matter how distant) capable of reflecting light must have size and mass, it follows that light rays are not traveling perfectly parallel to one another as they leave. There must always be a discernible angle, and the longer the focal length of the lens, the more that angle is resolvable; hence the extended infinity. Also (and alas for the marvels of technology), it is not always possible to machine a lens mount to the precise accuracy required when a supertele and a camera are put together on it. T-mounts are notorious in this respect. If you fail to screw them completely home, or the threads are a bit dirty, then the lens will be unable to come to the infinity mark. This, again, explains the leeway on the focusing mount. Finally, mirror lenses expand and contract according to changes in the ambient temperature (in fact most lenses do), and this tends to shift the focus a tiny fraction. Cementing all the elements into one solid piece, as is done in the Vivitar solid cat, is one attempt at reducing this thermal shift, especially since the Vivitar lens uses glasses with almost identical expansion and contraction coefficients. The longer the focal length, the more noticeable this effect becomes. If you don't believe me, go ask them to open the dome that houses the 200-inch Hale telescope on Mount Palomar during the heat of the day. Let me know if you survive the asking.

Most of the cameras used to test the mirror lenses for this article were aperture-preferred automatics with electric auto-winders fitted. Remember that a mirror lens is a fixed-stop system,

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so all of the exposure control must come from the shutter speeds of the camera. It is quite a chore to be twiddling the shutter speed dial continually, and an aperture-preferred automatic will take care of that part of the action with only an occasional glance at the shutter display to make sure that a shutter speed that is too low has not been selected. Auto-winders are nice because they advance the film each time you let go of the shutter release (or continuously, depending on the design), allowing you to concentrate on focusing and guiding the lens. 

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(see story beginning on page 49)

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DORCHESTER DAYS *continued from page 40*

check out Gene's camera bag. Sing-Sing, a local con-man, approaches and winks at the threatening men.

Then in a whisper, Sing-Sing says, "Jesus Christ, Gene! If you're going to walk around here carrying cameras, you'd better get a gun! Hey, do you want to buy one cheap?"

Manny's bar is choked with cigarette smoke. A black woman in a wide-brimmed red hat is flirting, though she is surrounded by unresponsive white men.

Gene places his camera right on top of the bar so that everyone knows he is there to photograph. To patrons, he is "the guy with the camera," someone obsessed with recording their lives, lives divided between the bar and rented rooms several blocks away: the retired doctor who has exchanged his once-thriving practice for long, angry afternoons of drinking; Rita, a Micmac Indian, who held her own birthday party with her three-year-old son as sole guest. Before she sliced the birthday cake, topped with plastic teepee and totem poles, the photographer made a picture of her in a second-hand dress purchased for the occasion.

Eddie is a heavy-drinking janitor. His wife has taken from her wallet a yellowed snapshot of Eddie when he was clear-eyed and 25.

The photographer has made a picture of Eddie also; a sympathetic portrait, but it shows eyes deeply shadowed, skin patchy and veined. Booze has made him an old man.

"After studying it at home for many hours, Eddie had to tear it up," his wife apologized to the photographer.

Although such disapproval does not usually come from the subjects of his photographs, Gene is used to criticism of his images. Photo workshop students poring over the Dorchester pictures label him "depressing" or a "do-gooder."

"Where's the happiness?" questioned the mayor of Dorchester's Little City Hall as she leafed through the faces of Uphams Corner. "Why is everything so disagreeable?"

Gene tries to explain that he makes images only of what he experiences. That the premature aging and loneliness, the rootless existences exposed in his photographs are simply the reflections of ten years of merciless changes in the area. That he began by looking for the Dorchester he knew as a child twenty years ago, and that very little remains of that home. 



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COLOR PRINTER'S BIBLE *continued from page 97*

in the paper box can cause, but I have never found any problem with the procedure; in fact, paper so stored seems to undergo color shifting at a considerably slower rate than unfrozen paper. If you haven't any freezing facilities, refrigeration will help.

It will probably be helpful to burn-in a new enlarger lamp for about half an hour before making any calibration prints for programming purposes. This is more necessary for ordinary incandescent enlarging lamps than it is for the tungsten-halogen-type bulbs now used in many color enlargers, but even with these the burn-in period will probably be useful. This burn-in is needed because the color temperature of incandescent lamps drops as they age. The most pronounced change takes place when the bulb is brand new. Once the burn-in is over, the bulb's aging rate decreases continually until the filament finally fails. It will also be useful to make new calibration prints from time to time as a precaution against the bulb's color shifting, and also as a precaution against acetate-filter fading, if you use CP filters.

Special techniques

It is possible to use an electronic color analyzer for a large number of special applications. They are capable of determining the contrast grade of paper on which a black-and-white negative should be printed, checking the color balance of studio lighting, or suggesting which PC filter to use with variable-contrast black-and-white paper. The instruments themselves don't really care what purpose they serve.

It is not practical to try to suggest the exact procedure that should be used with specific analyzers to fulfill any of these tasks; there would simply be too many to cover. But several manufacturers do offer such data in their instruments' operating manuals or upon request. If you do have an application that you feel your analyzer can fill, it might be useful to correspond with the instrument's maker for their suggestions on how to proceed. Or, you can simply think of the device you own as a sensitive light meter that is able to see light through three selectable, additive-primary filters and one selectable, unfiltered aperture. It probably won't take too long to work out a scheme to use your analyzer for anything from a reflection densitometer to the front end of a color-code-operated electric

garage-door opener.

This special section is the fourth in our series of articles on the craft of color printing. The first, second, and third installments appeared in the Summer 1976, Winter 1977, and Spring 1977 editions respectively. Copies are available for \$2.50 each, postpaid, from Ziff-Davis, Consumer Service Division, 595 Broadway, New York, N.Y. 10012. The Color Printer's Bible will be published, greatly expanded, in book form under the title, The Color Printer's Manual, by Amphoto, Garden City, N.Y. All material, copyright© 1976 by Bob Nadler.



WHAT YOU SEE *continued from page 48*

us around—that's right, I'm one of them! I've even done it with each of the illustrations that accompany this piece. After all, the manufacturers of average 35-mm SLRs tell us that their lenses are sharp all the way out to the frame edges and corners. That being the case, I find it very hard to deal with the fact that I can't see what my camera is recording on film along those frame edges and in those corners.

Certainly 35-mm negatives are small enough to begin with. If, as the manufacturers tell us, their lenses are sharp and contrasty out to the extreme corners of the negative image, then we ought to be able to print the image in those corners.

If I were designing a 35-mm SLR, it would have a viewing system capable of providing the photographer's eye with a *completely symmetrical* view of 115% of the scene being recorded on film. I would, of course, also scribe a bright line on the screen to show exactly 100% of the area being shot and another, much finer one, to show the borders of an average slide mount. I would give the viewer this extra bit of view so that my SLR would provide the same sort of insurance that a rangefinder camera's viewfinder does, against things that suddenly decide to move into your image. With a 115% screen, you would get a glimpse of someone or something moving in, say off to one side and behind your subject, and maybe you'd have a chance to be able to shoot before the unwanted subject got inside the 100% bright line. My version of the Supersnapperflex would be one machine in which what you see is *exactly* what you get.



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LETTERS

645—IDEAL FORMAT?
continued from page 91

Souping the yellow box

Read with interest your article on the Zone System in the Winter 1977 35-MM PHOTOGRAPHY. You stated that you rate Tri-X at E.I. 200. Please oblige me by stating your time and temperature for this in Kodak D-76.

Bill Leopold, Plainview, N.Y.

Vestal replies:

My "normal" development for Tri-X is eight minutes at 68 F; D-76 is diluted 1:1. In the Kodak Darkroom Data Guide, this is represented by a development number of 37½.

Finding the album

In your Winter 1977 edition, you published an article by Nancy Stevens about Peter Simon's family albums.

I enjoyed reading the article because I do similar work myself, and have been trying in vain for the last two years to find a company from which to order the handsome album (shown in the article) with the family name embossed.

Please let me know where Mr. Simon gets these albums.

Leigh H. Mosley, Washington, D.C.

Simon replies:

The albums are custom made by Brewer & Contelmo, 116 E. 27th St., New York, N.Y. 10016. You design the album and they produce it to your specs.

Pat on the back

I read just about everything in photographic publications, but the article by Dan McCoy on Larry Schiller (Winter 1977) was the best damned thing ever published about photography and the men who are in it.

My congratulations to McCoy on an extremely well written story and my hat off to you for seeking the Larry Schiller story out.

Thomas Nebbia, Copenhagen, Denmark

hand side of the viewfinder, with setting indications displayed along with metering information. Then the ETR would definitely approach the speed and ease of operation of a fine 35-mm SLR.

I see the 645 format as the wave of the future. The combination of a very usable negative format with a relatively small camera size holds a potential for virtually all photographers. Some exceptions would be photographers who need a large-format view camera with its tilts and swings, those who want to work in a square format, and those who require very compact cameras. The 645 format could become the long-awaited format for all occasions.

As mentioned before, I occasionally use a Kowa 6 when I need to work with a larger image. The Kowa is a fine camera, and the new Super 66 has an innovative design, complete range of lenses from fish-eye to long telephoto, and an array of accessories including five finders and a Polaroid back.

The Kowa is one of the least expensive 6x6 cameras available and certainly the most underrated in its format. The Super 66 has interchangeable backs with a built-in automatic light shield—a fascinating innovation that requires no removal and reinsertion of a slide to change backs. When the shutter/film-advance lever is cocked, the dark slide is in place for back removal. I am happy with the Kowa I own, and would not hesitate to buy a Super 66, if 6x6 were my primary and most-needed format. Interchangeable film backs are convenient, but two Nikons (for color and black-and-white) are more portable and far faster to use than one square-format camera. I like working at eye level with a laterally correct image, especially as I do a lot of shooting on the go.

I tend to use my Nikons even in the studio because I am used to them. They are like an old, comfortable pair of shoes—you have a new pair but continue to wear the old familiar ones because they feel so right and good. In fact, I am already starting to feel that way about the Bronica ETR, despite its faults. The ETR fits well in the palm of the hand, balances well at eye level, and has interchangeable backs to boot. And that marvelous Speed Grip allows you to advance film and cock the shutter using only the thumb. The Bronica lets the hand stay where it belongs, which allows for faster eye-level action than with a

crank-operated system.

The ETR's viewfinder gives a large, bright image. I found it a delight to focus even in very dim available light. Even with its f/2.8 lens, I found it to be as bright as some 35-mm SLRs with one-stop-faster lenses.

The clincher for the ETR is its system approach. First, there are the interchangeable backs—120 and 220 (which should be combined into one unit), 70-mm, and Polaroid. A motor drive is coming soon. There is a bellows-type lens shade that accepts three-inch-square gelatin filters and will also hold a planned slide-copying attachment. Also coming are automatic extension tubes, a rotary viewfinder, a sportsfinder, a quick tripod release, and a zoom lens.

The things I don't like about the ETR have to do with difficulty and inconvenience of operation. All controls on the AE finder fall into these categories. The ASA setting and the exposure compensation controls are on the same small knob—either must be operated carefully in order not to disturb the other.

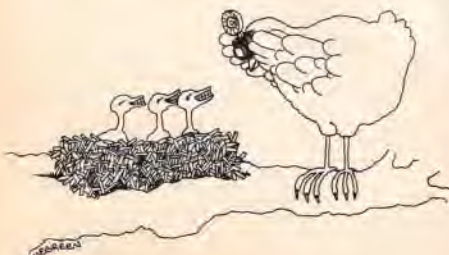
There should be some place to put the dark slide when removed, especially when shooting out in the field. I have taped its leather holder to the back, but extra backs do not come with dark-slide holders.

The multiple-exposure lever of the ETR is located in a spot that is hard to reach with the Speed Grip attached. But this is only a minor complaint. More serious is the strap attachment to the camera body lugs: the strap will pop off if picked up in the wrong position. Needless to say, this is dangerous, especially when shooting on the go!

A major complaint about the ETR is meter sensitivity, or really the lack of it. For a camera with a bright viewfinder that virtually cries out to be used in available-light situations, it is a shame that it doesn't have a meter sensitive enough to work under very low light levels.

Finally, the ETR uses an electronically controlled leaf shutter mounted in each lens, which means no instant-return mirror. The blackout after exposure did not bother me, but it does bother some people.

The shutter of the M645 is also electronically controlled, but it is a focal-plane design that permits an instant-return mirror. Such a feature is a great aid to rapid shooting, and would probably help some 35-mm photographers to feel comfortable with the M645. There is a mirror lockup for



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- 5—"The Professional System: Because Every Shot Counts." A full-color booklet describing the advantages of Rapid Omega professional system cameras and the "Ideal" 6x7cm format. Also details Rapid Omega's complete line of accessories. BERKEY MARKETING COMPANIES.
- 6—"A New Dimension in Photographic Convenience." A full-color brochure describing the Konica C-35 EF with built-in electronic flash. Includes a mini-lesson on how best to use electronic flash. KONICA CAMERA COMPANY.
- 8—Omega View 45E System. Complete technical information, plus a lesson on the many advantages of view camera photography with the Omega View 45E System. BERKEY MARKETING COMPANIES.
- 22—40 page color brochure on the first automatic Leica camera the new electronically controlled Leica R3 35mm single lens reflex camera system. E. LEITZ, INC.
- 41—"A 12-page beautiful four-color pamphlet describing the Chinon CS, the finest economy SLR available, Chinon CX II, light weight 35mm SLR with the sophisticated double exposure capabilities, Chinon CE II, Memotran, auto-electronic advanced design SLR. Also described is the Chinon 35 EE (The Little Giant), light weight compact rangefinder. Accessories and complete line of Chinon coated and multi-coated lenses designed for use on almost any existing SLR camera. Handy specifications check list is also included. CHINON CORP. OF AMERICA.
- 45—Booklet describing the U-Phot, the only absolute water-proof 35mm miniature camera. THE ALPA GROUP.
- 46—Beautifully illustrated four-color brochure describing the Alpa line and its accessories. THE ALPA GROUP.
- 47—"The Alpa catalog describing its full line of cameras, lenses, adapters, adapter rings, filters, extension accessories, miscellaneous accessories and darkroom equipment. THE ALPA GROUP.
- 49—"Pentax MX." Full color 12-page brochure on the world's smallest, lightest, most compact full-featured 35mm SLR. Describes the revolutionary new lightensensitizing GPD diodes and non-flicker LED exposure read-out system. Contains full information on the Pentax MX Motor Drive and Motor Wind, the 250-exp. magazine and two data backs, plus complete chart of over 40 SMC Pentax and the new line of miniaturized SMC Pentax-M lenses. PENTAX CORPORATION.
- 50—"Pentax ME." The world's most compact, smallest fully automatic 35mm SLR. 12-page full color brochure details full specifications, describes the revolutionary "invisible shutter dial" exposure system based on the new GPD light sensing photodiodes, the non-flicker LED exposure-read-out system and motorized film advance. Also lists full details on over 40 SMC Pentax lenses including the new line of miniaturized SMC-Pentax-M lenses. PENTAX CORPORATION.
- 63—"A new 12-page, 4-color illustrated brochure on the Hasselblad SWC Camera, the "wide-angle" camera in the great Hasselblad System. The super-wide camera's permanently mounted 38mm f/4.5 Zeiss Biogon Lens yields images of utmost brilliance and resolution, with a minimum of rectilinear distortion, even when used "wide-open." The Hasselblad SWC is an extremely light and compact 2 3/4" camera and is ideal for fast action usage as well as special wide-angle application. BRAUN NORTH AMERICA.
- 64—"A new 12-page, 4-color illustrated brochure on the Hasselblad 500EL/M camera; the motor drive camera in the great Hasselblad System.

A library of useful information is available to photographers free, thanks to the instructional literature many manufacturers offer. There are, no doubt several booklets described here that will interest you. You can circle as many choices as you wish on the coupon below. Mail directly to 35mm PHOTOGRAPHY. Your requests for literature will be forwarded to the manufacturers concerned.

With a variety of optional, remote control triggering devices available for use with the 500EL/M, the camera is considered a "must" for the child, portrait, fashion and sports photographer. An automatic, instant return mirror is another major benefit of the 500EL/M. BRAUN NORTH AMERICA.

MOVIE CAMERAS

- 9—Elmo Single System Super 8 Sound Camera. Four-color brochures describing the 350 SL, 300 SL, 600 SD and 1000S Sound Cameras, giving space, features and all other pertinent facts. ELMO MANUFACTURING CORP.
- 10—Elmo Double System Sound Camera: The 612R and 1018R described in detail in four-color brochures which list the specs and key features in detail. ELMO MANUFACTURING CORP.
- 11—Elmo 311 Low Light Camera. A brochure describing the perfect low light non-sound movie camera. Gives all specifications and features. ELMO MANUFACTURING CORP.
- 12—Cosinasound Super 8 sound movie cameras. A brochure describing the complete system of Cosinasound Super 8 movie cameras including the wide range of creative accessories available with the Cosinasound Super 8 System. BERKEY MARKETING COMPANIES.
- 23—24 page four-color brochure describing the features and technical data on the Leicina Special movie camera. E. LEITZ INC.
- 44—Sound Super 8 Cameras. Beautiful four-color, 6-page pamphlet describing the small weight, small size, big features of the Chinon 107 XL Dart, Chinon 107 SXL, Chinon 257 SXL, Chinon 407 XL, Chinon 507 SXL and Chinon 607 XL. All cameras accept the famous Chinon Boom Microphone. Chinon Movie Accessories and 5 sound projectors are also described in the pamphlet. CHINON CORP. OF AMERICA.

LENSES

- 14—"Lighter! Smaller! Sharper!" A colorful brochure on Tamron F System Lenses describes in detail the full line of Tamron fixed-mount lenses for Canon, Konica, Minolta, Nikon, Olympus and for Pentax screw-mount cameras. Also in the brochure is a mini-lesson on how to use lenses for maximum creative control. BERKEY MARKETING COMPANIES.
- 15—"Konica Hexanon Automatic Exposure Lenses." A color brochure describing the full line of Konica Hexanon lenses ranging from 15mm full-frame fisheye to the 1000mm f8 mirror lens. Brochure also includes a brief story on how Konica lenses are manufactured. KONICA CAMERA COMPANY.
- 17—Schneider Lens Selection Guide. A detailed folder with complete listings and descriptions of Schneider larger format camera taking lenses and enlarging lenses, including the new (Betavaron) zoom enlarging lens. SCHNEIDER CORPORATION OF AMERICA.

LIGHTING EQUIPMENT

- 18—A complete recap of features, specs and pictures of the Toshiba Electronic Flash line including all Thyristor, Automatic and Manual modes. ELMO MANUFACTURING CORP.
- 20—"An Invitation to Electronic Flash Photography." A beautiful full-color brochure describing the complete line of Sunpak Electronic Flash Units and accessories; including Sunpak's new Noco infrared flash and Marine underwater flash. BERKEY MARKETING COMPANIES.
- 21—Four-page catalog on lighting equipment and photographic accessories. SMITH VICTOR CORPORATION.

PICTURE TAKING ACCESSORIES

- 24—"Slik Tripods and Tripod Accessories." A brochure describing the Slik line of lightweight/compact, System, Master, Master Pro and Studio Tripods and the 14 Slik Tripod Accessories. Also contains a mini-lesson on how to use a tripod to take professional-quality photographs. BERKEY MARKETING COMPANIES.

PROJECTORS, SLIDES & SCREENS

- 25—Four-color leaflet on the new Leitz Pradovis R150 projector. E. LEITZ INC.
- 26—Four-color brochures describing the ST-800 Magnetic and Magnetic/Optical Sound on Sound Projectors. Also complete specs and features on the new ST-600, ST-1200 HD and GS-1200 (Stereo) Double Track Recording Projectors. ELMO MANUFACTURING CORP.
- 27—Elmo K00-SM—Non-Sound Dual Projector with unique sound synch. Four-color brochure shows all features and specs. ELMO MANUFACTURING CORP.
- 28—Projection Screen Selector in a colorful folder presents complete line of Da-Lite Slide and Movie Screens shows what size to choose. DA-LITE SCREEN COMPANY.
- 29—Brochure describing Automatic Electric operated slide and movie projection screens, giving information on all sizes. DA-LITE SCREEN COMPANY.
- 43—Chinon 6000, 7000, 7500 and 9000. All projectors offer unsurpassed sound quality, outstanding features, and exceptional optics. CHINON CORP. OF AMERICA.

DARKROOM EQUIPMENT

- 30—A brochure listing and describing the full Hansa darkroom line in detail. ELMO MANUFACTURING CORP.
- 31—"Omega System 600 makes it all happen." A full-color brochure describing the new Omega System 600 enlargers and darkroom accessories. Brochure details how, with the modular concept of the System 600, to customize your enlarger to meet individual needs economically. BERKEY MARKETING COMPANIES.
- 34—Premier Products for Photography Catalog No. 576 provides detailed specs, illustrations and applications information on a comprehensive line of darkroom equipment. The catalog features dryers, trimmers, easels, safelights, paper safes, bulk film loaders and many darkroom accessories. PHOTO MATERIALS.
- 35—Bulletin 300/400 describes Dimco's Photographic Darkroom Timers. Model 300 Universal Timer for developing and color processing, printing and enlarging. Model 400 Printing/Enlarging Timer for multiple prints or production work. DIMCO GRAY CO.
- 51—Booklet describing the Beseler Color Analyzers for fast and accurate color enlarging. BESELER PHOTO MARKETING.
- 52—Illustrated booklet describing Beseler's 23C Enlarger, for color or black-and-white prints with negative formats from 8mm to 2 1/4" x 3 1/4". BESELER PHOTO MARKETING.
- 54—Booklet on Beseler's 45M Series Enlarger for negatives from 8mm to 4"x5". BESELER PHOTO MARKETING CO.
- 57—Illustrated booklet on Beseler's Negatrans. The smooth and easy flow-through negative carrier. BESELER PHOTO MARKETING.

MISCELLANEOUS

- 37—Two exciting new courses in dozens of cities throughout the United States. The Nikon School of camera basics, four hours to help you get the most out of your camera. The Nikon School of 35mm Techniques, 10 hour multi-media presentation covers all major photographic subject areas (no matter what camera you own), taught by trained, experienced instructors. Registration and schedule available for 1977/78 semester. THE NIKON SCHOOL OF PHOTOGRAPHY.
- 39—Elmo Sound Editor #912. A four-color sheet outlining the many features of this complete Sound Editing system. ELMO MANUFACTURING.
- 59—Hasselblad - Landscape Photography. A 20-page, four-color illustrated handbook on how to produce outstanding landscapes. BRAUN NORTH AMERICA.
- 60—Hasselblad - Wildlife Photography. A 20-page, four-color illustrated handbook on how to achieve maximum in Wildlife Photography. BRAUN NORTH AMERICA.

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critical exposures at slow shutter speeds. Also available is a 70-mm f/2.8 lens with a leaf shutter for electronic flash synchro-sunlight work and flash operation where faster than 1/60-second speeds are needed.

Another good feature of the M645 is the extra release button on the top-right corner of the body front. It is very handy when shooting vertically without the hand grip or pistol grip.

The Mamiya uses film inserts, which are preloaded and then put into the body. The shape of the camera could have accommodated changeable backs, but Mamiya went the other route, which means no changing film in mid roll and no Polaroid.

The view through the M645's prism finder is smaller and darker than the ETR's. Meter sensitivity is excellent, certainly up to snuff for low-light-level work, so it's a shame that the viewfinder is not brighter.

Some things bother me about the design of the M645: the smallest aperture ring is too close to the body to be easily adjustable with my big hands and it is partially blocked by the shutter release button; the lenses are not particularly easy to grasp and twist for removal and attachment to the body; depth-of-field previewing, done by an auto/manual slide switch located behind the aperture ring, is difficult for me to accomplish without popping around to the front of the camera and coaxing the switch into position. (Again, the new M645 1000S comes to the rescue with a depth-of-field control on the camera body.)

It would be intriguing to speculate on Mamiya's plans to add to, improve, or further develop the M645 into a system. The back cover is removable—possibilities for a motor drive? The film advance crank is also removable—will a Speed Grip or a motor drive attach there? And what about an automatic viewfinder?

Just as I was finishing this article, the Bell & Howell/Mamiya Company introduced the advanced model M645 1000S and new accessories.

The 1000S has 14 speeds from 1/1,000 second to 8 seconds plus bulb. Other new features of the M645 1000S include:

- A 45-degree split-image screen with dual-ring focusing collar provided as standard with the camera body;
- positive shutter speed dial lock, which must be depressed before shutter speeds can be changed, eliminating the possibility of accidental shutter speed

changes;

- five- to ten-second-delayed shutter release provision;
- film winding crank with swivel tip for faster winding;
- depth-of-field preview lever mounted on the camera body;
- film-plane index mark for close-up photography; and
- new battery compartment cover lock.

Three new lenses have been added to the M645 line, making a total of 11 now available. The new ones are an 80-mm f/1.9 high-speed normal lens (\$300), a 35-mm f/3.5 very-wide-angle lens (\$400), and a 300-mm f/5.6 telephoto (\$500).

The six new accessories include the PD Prism Finder S with speeds to 1/1,000 second (otherwise the same as the one I reported on here) and an economy model prism/meter, the CDS Prism Finder S. The latter is an eye-level, through-the-lens finder activated by a positive on/off switch that provides open-aperture, center-weighted exposure measurement. It is self-powered, gives match-needle readings from EV 3 to EV 18 at ASA 100 (f/5.6 at 2 seconds to f/22 at 1/1,000 second). Shutter speed settings must be transferred manually from the meter to the camera. This meter prism costs \$100 less than the PD Prism S. Other new accessories include the waist-level Sports Finder S; revolving tripod adapter; Quick shoe Model 2 tripod adapter; and the Auto Extension Ring Set S.

The new M645 1000S with PD Prism Finder S and the 80-mm f/1.9 high-speed normal lens has a suggested retail price of \$1,100. The regular M645 will be kept in the line, at a slightly lower price than previously. Although I have not yet used the 1000S, I take it as a positive step in the 645's evolution.

The normal lens that I used with the M645 is the Mamiya/Sekor 80-mm f/2.8; the ETR has a Zenzanon 75-mm f/2.8. Both systems have moderate telephotos of 150-mm f/4, equivalent to 90-mm on a 35-mm camera, a good length for portraits and candid shots.

The Zenzanon 40-mm f/4 is equivalent to a 24-mm lens on a 35-mm camera—it covers a wide-angle view undistorted, or can easily distort through off-axis and close-perspective compositions. Mamiya/Sekor's 45-mm f/2.8 is a stop faster and a fine lens, with slightly narrower field of view and somewhat less potential for "creative" distortion. Personally, I prefer the wider angle of view with the ability to distort

over the extra speed.

The Zenzanon 50-mm f/2.8 is an excellent moderate-wide-angle lens equivalent to 30-mm on a 35-mm camera. The M645 has a 55-mm f/2.8 that, again, gives a slightly narrower view.

Major considerations about any new cameras are durability and trouble-free operation. I have only used the ETR and M645 for a few months. Early in this period, both had shutter trouble, but they have worked well since being fixed.

If the reputations of Mamiya and Bronica count for anything, both the M645 and the ETR should be welcome and reliable additions to the world of photography.

And now to answer that last lingering question in your mind: "What does it all cost?" Here is a cost-comparison chart quoted at the manufacturers' list prices:

- Bronica ETR with Speed Grip, back, 75-mm f/2.8 lens, and AE Prism: \$1,345.
- Mamiya M645 with insert, 80-mm f/2.8 lens, and PD Prism: \$869
- Nikon F2 Photomic with 50-mm f/1.4 lens: \$845
- Kowa Super 66 with 12/24 back, waist-level finder, and 85-mm f/2.8 lens: \$740

I recommend that the Kowa be used with a hand-held meter rather than either of its through-the-lens options, which are expensive for non-coupled, no-information-in-the-prism meters.

As the folks at Mamiya are quick to point out, an M645 outfit plus an extra body can be bought for the price of the Bronica. True, but you would have to switch the lens and prism every time you needed to switch films in mid-roll. Alternatively, you could buy an extra lens and a few inserts for the same money—and the Mamiya lenses are much cheaper. Most of the price difference is for the leaf shutter in each Zenzanon lens:

The following are manufacturer's suggested prices for the lenses that I used.

Zenzanon 40-mm f/4:	\$715
Zenzanon 50-mm f/2.8:	\$615
Zenzanon 150-mm f/4:	\$560
Mamiya/Sekor 45-mm f/2.8:	\$320
Mamiya/Sekor 55-mm f/2.8:	\$250
Mamiya/Sekor 150-mm f/4:	\$240 



35-MM PHOTOGRAPHY



8 out of 10 top professional photographers entrust their talents to Hasselblad. Here's why.

A market research survey team asked a representative sample of top commercial photographers in major markets around the country: "Which brand of medium format camera do you presently use in your work?" Eight out of ten said Hasselblad. And they named Hasselblad ten to one over the next leading brand.

Such overwhelming favoritism is based on good, sound photographic reasons. Here they are:

Reliability

Every piece of Hasselblad equipment is built tough, for professional use. Hasselblad's legendary reliability is confirmed by its continuing use in NASA space missions since 1962. Quality control is rigorous and thorough. Every unit goes through shutter tests (500 shots). Random samples are rapid-fired up to one million exposures at the rate of 2,500 shots per hour.

Flexibility

Hasselblad's three cameras are designed to meet most all photographic challenges a professional is likely to encounter. Hasselblad evolves new equipment under two criteria: Always anticipate the professional's needs, and never cause his Hasselblad system to become obsolete. Hasselblad now offers 14 lenses, 9 film backs, 9 viewfinders and over 200 accessories. All work perfectly with every Hasselblad body built since 1957.

Results

The professional photographer demands outstanding results day in day out. The rugged Hasselblad system—with its superb Carl Zeiss optics and versatile 2¼-square format—delivers those results without compromise. To meet the boldest photographer's challenge.

Precision

Now, as in the last twenty-five years, Hasselblad craftsmanship, durability

and performance are legendary. The secret: precision in design, manufacture, testing and servicing. Hasselblad sets its own rigorous standards of quality. For example, most tools and instruments used in building and testing a Hasselblad are themselves designed and manufactured by Hasselblad. Hasselblad insists that these steps are necessary to maintain the finest quality in what is, virtually, a hand crafted camera.

Cost

As any professional soon discovers, "getting by" is a precarious philosophy when one's livelihood and reputation are at stake. In the long run, the best investment costs the least. Hasselblad proves this. It saves time. It saves work. It saves repair bills. It saves trading up (obviously). It always delivers! In fact, that's why eight out of ten top professional photographers entrust their talents to Hasselblad.

H A S S E L B L A D

The system preferred by the serious photographer.

NIKON EL2

Here is the automatic slr that will be the state of the art for years to come. The new Nikon EL2. With the most foolproof, most versatile of aperture-preferred automatic exposure systems. And full personal control of exposure. Add the optional Auto-Winder, and even the film advance is automated! Combine all this with the superb new AI Nikkor lenses, and there's simply no other choice in an automatic 35.

Focus, shoot, period

The EL2 takes the mechanics out of the art of recording an image. Focus, press the button. Release the button, and the Auto-Winder advances the film—as fast as two frames per second. Your eye remains constantly on the subject. You never miss a shot. This is high performance automation!

We developed silicon blue cells one stop further, and the result was the Silicon Photo Diode Meter system. Combined with a unique Nikon Functional Resistance Element, it delivers data to the electronically-controlled metal focal plane shutter. Speeds are adjusted continuously, precisely in the eight-seconds-through-1/1000th range. And there's strobe synch at 1/125th!

Multiple personal control options

When you wish to take over personal control, the EL2 offers you more options than any other automatic. A special exposure compensator allows you to intentionally under- and overexpose. For bracketing, to lock in a reading (on a backlit face, for example), there's a handy Memory Lock. Or you can use it as a match-needle camera.

Aperture priority: the professional's choice

Professionals demand aperture-priority automation. The photographer chooses the lens aperture, the camera chooses the shutter speed to match (keeping you constantly informed in the viewfinder). The result is complete command of depth-of-

field, and of selective focus.

The EL2 offers full automation with every one of the more than 55 superb reflex-viewing Nikkor lenses in the Nikon System—including mirror and other non-automatic lenses. Even with bellows, microscopes, telescopes.

Instant-Interchange lenses

A new 6mm-to-600mm series of instant-interchange AI-Nikkor lenses extends the EL2's ease and speed of operation still further. You can attach any AI-Nikkor with a quick quarter turn, without concern for its aperture setting, and enjoy full-aperture metering. These lenses also work on

earlier Nikon System cameras. The EL2, of course, takes non-meter-coupled Nikkor lenses, through 2000mm, with stop-down metering. Non-AI Auto-Nikkors can be used in the stop-down mode or, in most cases, modified for AI operation (write for Lit/Pak N-27 if interested). No other automatic offers a comparable choice!

Nikon Information: For details on the Nikon EL2, check the Yellow Pages for the Nikon dealer nearest you, or write for Lit/Pak N39. Also, ask about the new two-course travelling Nikon School of Photography. And in New York City, come to the new Nikon House in Rockefeller Center.

Nikon Inc., Garden City, N.Y. 11530. Subsidiary of Ehrenreich Photo-Optical Industries, Inc. (In Canada: Anglophoto Ltd., P.Q.) 

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**Introducing the new Nikon
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the only automatic with Nikon quality.
A superb Auto-Winder provides total automation.**

